POPULAR AVIATION

Including SOUTHERN AVIATION and AERONAUTICS

A MAGAZINE FOR THE PROMOTION OF PRIVATE FLYING AND COMMERCIAL AVIATION

Volume XX JUNE, 1937 Number 6

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POPULAR AVIATION, Volume 20, Number 6. June, 1937. Published monthly by Ziff-Davis Publishing Company, at 608 South Dearborn Street, Chicago, U. S. A. William B. Ziff, Publisher; B. G. Davis, Editor; John B. Rathbun, Managing Editor; Swanee Taylor, Associate Editor. New York Office, 381 Fourth Ave., New York City. Subscription $2.50 per year, single copies, 25 cents; foreign postage, $1.00 per year extra except Canada. Contributors are especially advised to retain copy of their contributions, which must be accompanied by return postage. All such material will be handled with reasonable care, but this magazine assumes no responsibility for its safety. Any copy accepted is subject to revision or changes to meet the requirements of this publication. Payment for copy used will be made at our current rates upon publication and photos and drawings will be considered as constituting a part of the manuscript in making payment unless otherwise specified. Entered as second class matter, January 24, 1933, at the Post Office, Chicago, Ill., under the act of March 3, 1879.

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Some Tactical Combinations in

Well Developed Planes in Use by the U. S. Navy

by

ROBERT McLARREN

The Curtiss "Goshawk" BF2C-1, with its characteristically retracted landing-wheels.

Three-quarter view of the Vought Scout-bomber SBU-1, a sturdy 2-seater biplane.

Direct side view of the Vought SBU-1 above showing tail-group and tail-wheels.

WITH the advent of the 1,000-horsepower engine, the 250 mile per hour service plane and the tremendous load-carrying ability of recently accepted types of aircraft, a new stress has been placed upon the Naval airplane as a single unit.

The tactical division of the Naval Air Service into highly specialized groups wherein each type ship had one, and only one special duty to perform, resulted in the acceptance into the Service of over a dozen different types of ships. Several major details have combined to modify this practice to a great extent.

Primary reason for this modification was the similarity of type between two and even three divisions. The scout plane usually consisted of a two-seater biplane with a single gun for the pilot and twin guns mounted on rings for the observer. Equipment consisted of maps, cameras, radio, signal charts, gunnery tables, and similar details. The bombing plane consisted of a two-seater biplane with one gun firing forward and two for the observer.

This type was equipped with complete installations of bombing devices, radio, bomb racks, bombing toggles and sights, and similar details. The observation plane was also usually a two-seater biplane with the pilot handling one forward gun and the observer equipped with two instruments mounted on special gun-rings. Equipment consisted of maps, cameras, radio, and similar details.

The Naval high command soon noticed the obvious similarity of type as well as installation features of the three designs. Yet, each division called for its special tactical designs in both mission and training.

The first thought was to combine these three types into one, but the obvious overload should these three installations be placed on a single ship voided this solution. Therefore, this desire of the technical staff of the U. S. Navy has of necessity been held in abeyance until the designers could produce a ship capable of absorbing these testing specifications.

Secondary reason for this revision was the essential economy of the practice. By purchasing one plane which served the purpose of three the Naval Command might well boast of her departmental economy.

Third, and lastly, the very nature of the advance of aviation became an efficacious part of this new plan. Foresighted Naval Officers saw the keen insight of this plan and the advisability of a delay in their tactical combination plans until the advance of aircraft design could bring to them a

Present U. S. Naval Aviation

ship capable of performing under these triple assignments.

For a number of years the engineering section of the U. S. Navy has been anticipating the picture which now has been painted in reality; the appearance of the "Scout-Bomber," "Bomber-Fighter," "Torpedo-Bomber," and the "Scout-Observation" type of ship.

These dual and even triple-mission designs are now operating in squadron service with the United States Fleet; the realization of, not precisely a dream, but rather a practical plan based upon service adaptability born in the minds of farsighted Naval Officers.

Our actual observation of a few of these types would doubtless prove of interest. Possibly the first dual-designated ship was the Boeing XF6B-1 type. This "Twin Wasp Junior" powered biplane was designed primarily as a fighting ship as its original Naval designation exemplifies. Found to be inferior under tests the ship was re-designated XBFB-1, or "Bomber-Fighter." (The reader should bear in mind that Naval designation policy allows each builder a letter which immediately precedes the "dash." In this instance, the second "B" designates the Boeing Airplane Company).

This designation, however, came as a result of the failure of the ship to live up to specifications and the resultant consignment to a heavier duty classification. This ship was not one of the long-desired dual-types as obviously it could not meet the exacting demands of such a plane. We mention this ship merely as being of historic interest and as being the first ship to bear the dual designation on its rudder. This set of circumstances also resulted in the re-designation of the Curtiss "Goshawk" from F11C-2 (Fighter) to BFC-2 (Bomber-Fighter).

The first ship primarily designed as a dual-purpose plane and accepted into Naval service as such is the famous Vought SBU-1 (Scout-Bomber). This sturdy ship is a two-seater biplane powered by a P&W "Twin Wasp Junior" of 750 horsepower.

In supplement to its regular role of a scouting plane, the addition of bombing equipment has combined two distinct classifications of the Naval Air Service. Sturdiness of construction, high speed, adaptability, and the powerful 750 horsepower engines rendered this type highly suitable for dual-service. The First, Second, and Third Scouting Squadrons are now equipped with this type machine and commandants state that it is living up to the demands made upon it in every detail.

The Curtiss SOC-1 (Scout-Observation) biplane has also been delivered in large quantities to North Island Naval Air Station, San Diego, California. The similarity between these two classifications is so marked as to make them identical and the combinations into a single type ship were inevitable. Over 140 of these ships are

These Planes Have Passed Strenuous Service Tests

The Grumman XSBF-1 with hull enclosed, retractible wheels and enclosed cockpit.

The Curtiss SOC-1 equipped with a P & W 550 h.p. Wasp engine. Note the "E" on fuselage denoting excellence in gunnery.

A side view of the Curtiss SOC-1 showing details of the tail group and cabane.

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now undergoing delivery to the Cruisers Scouting Squadrons.

The versatility of these ships is emphasized by the fact that the landing gear can be changed to floats for water landings in 15 minutes. Operations with the Cruisers and the resultant strain taken by repeated firings from catapults impose severe tests on ships of this type and only the most commendable designs are accepted for service. Strength and durability are predominant in the Curtiss SOC-1.

Two types, radically different in purpose, yet obviously similar in design had not been combined in the Navy's new tactical combinations. Noting the assuring results obtained in other combinations, Naval engineers set to the task of evolving a single ship capable of performing the dual purpose of the torpedo and bombing planes. Herein lay a problem not so easily solved as in other designs.

Specifications called for a ship capable of carrying a full complement of bombs ranging in size from 25 pound fragmentation bombs to the huge demolition capsules and in addition to nestle a 1,000 pound torpedo within her belly, a strain great enough to force any designer to give up in despair.

Not content with this, however, the specifications called for a top speed of more than 230 miles per hour! "Preposterous," some thought, yet those Naval Engineers who had been biding their time knew full well that their wait had not been in vain and that a plane which might even surpass these specifications could be built.

Receiving sealed specifications, several factories began to work with the utmost secrecy on this mighty weapon of destruction. Sleek and deadly approval designs appeared at the Naval Aircraft Experiment Station at Anacostia, D. C.

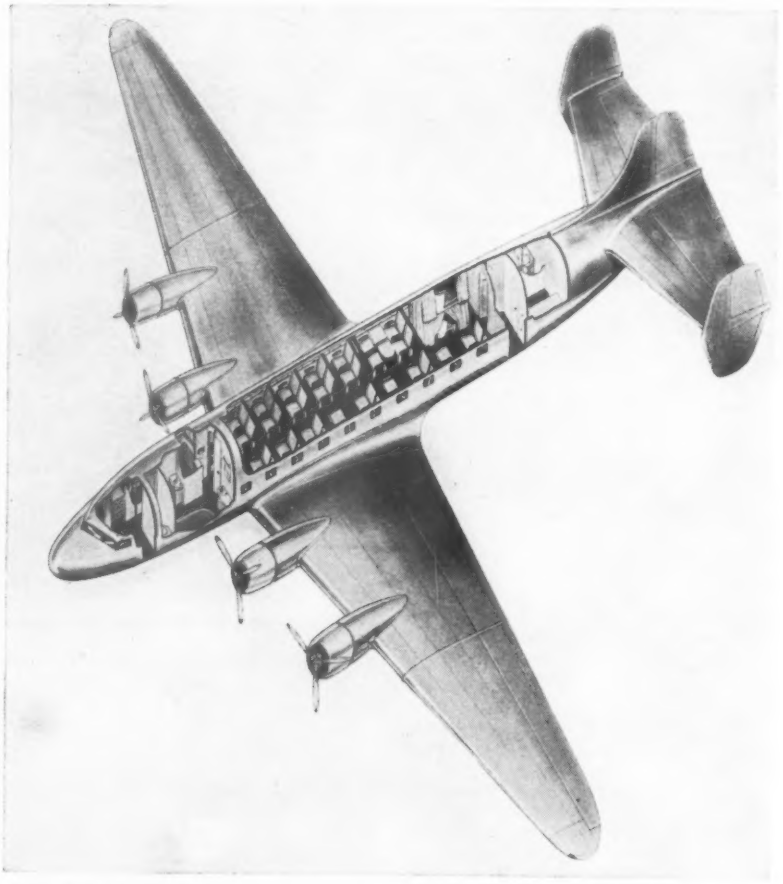
Day after day these all-metal ships roared away from the Station with over a ton of lethal capsules tucked under their wings, their retractable landing gears drawing snugly into twin recesses in wings and bodies, their 1,000 horsepower engines crying out a song of resentment at such a task. Through it all flew Donald Douglas's mighty dreadnaught of the air, the XTBD-1 (Torpedo Bomber).

Finally, the tests were concluded, the results were recorded and an order for 114 Torpedo-Bombers was awarded to the Douglas Aircraft Corporation of Santa Monica, California, builders of the plane which had carried victory to the Naval engineers who had planned and waited in patience for the day to arrive when such a ship could be completed.

Experimental developments of dual types are well under way at Anacostia. The designers have focused all their abilities on this type plane and are constructing ships with a greater variety of adaptabilities to service demands. At present undergoing experimental tests at the Station are: XSBC-2 (Curtiss Scout-Bomber), XSBC-3 (Curtiss Scout-Bomber), XSB2U-1 (Vought Scout-Bomber), XSB3U-1 (Vought Scout-Bomber), XSBA-1, (Brewster Scout-Bomber), and XSBF-1 (Grumman Scout-Bomber). The Naval Patrol Boat Experiment Station at San Diego also has two types under tests, the

(*Concluded on page* 56)

Another Giant Douglas Plane Projected



An artist's phantom view of the new Douglas DC-4 showing passenger compartment arrangements, lavatory, galley, and navigational cabin. The four engines are mounted along the tapering leading edge with the propeller planes staggered.

REFLECTING the genius of the largest group of aviation engineers ever brought together on a single project, the Douglas Aircraft Corp. of Santa Monica, California, announces completed plans for the Douglas DC-4, the world's largest air transport.

Representing an expenditure of a million dollars and the close cooperation of the engineering staffs of TWA, United Airlines, American Airlines Inc., Pan American Airways, Eastern Airlines and Douglas, the plane will have four engines and will accommodate forty passengers.

Although the company has made no definite announcement as to when the new super ship will be ready for delivery to the five airlines, it is anticipated that the first unit will take the air for initial tests by early Fall of this year. It is said that four years of constant research have already been devoted to the craft's development.

A fair idea of the DC-4's size and performance may be gained by the following comparisons with the present Douglas DC-3, which itself is considered a giant among planes:

COMPARATIVE SPECIFICATIONS

	DC-4	*DC-3*
No. of passengers	40	21
Crew	5	3
Span	138′ 3″	95′
Length	97′	64′ 5″
Height	24′ 4″	17′ 6″
Engines	Four @ 1250 h.p.	Two @ 1100 h.p.
Cruising Range	2200 mi.	1800 mi.
High Speed	237 m.p.h.	216 m.p.h.
Gross Weight	60,000 lbs.	24,000 lbs.
Absolute Ceiling	24,000 ft.	24,000 ft.
Service Ceiling	22,900 ft.	21,800 ft.
Flight on 2 Engines at	7,700 ft.	On one at 8,200 ft.
Useful Load	20,000 lbs.	8,294 lbs.
Mail, Express, Baggage	6,500 lbs.	3,450 lbs.
Landing Speed	68½ m.p.h.	64 m.p.h.

A comfort factor for passengers will be level landing of the ship on its "tricycle" landing gear. This feature will be of especial benefit to sleeping passengers whose rest need not be disturbed by landing.

(*Concluded on page* 64)

The "Mad Major's" Escapades

by CARL B. OGILVIE

One of the author's true stories of the World War that contains incidents stranger than fiction. Because of his German name and his unusual practices, Carl Spatz frequently faced grave dangers on his own side of the line.

JUNE had been a remarkable month in the life of Carl Spatz, ranking veteran pilot in point of flying service, of the U. S. Army Air Corps.

He was born on June 28, 1891, graduated from West Point June 12, 1914, became a pilot of the 1st Aero Squadron June 15, 1916, graduated from several Army service schools during his "lucky" month, and on June 30, 1936, was assigned to duty with the most distinguished unit of our air service—the General Headquarters Air Force.

June, 1937, marks the 46th anniversary of his birth at Boyertown, Pa., and 22 years of service as a military pilot. Carl Spatz today, slight, wiry, energetic, strong as hickory, is the outstanding member of a small group of distinguished American war-time aces who are still in the military service. Including his entry at West Point in 1910, Carl Spatz has served our country continuously and with marked distinction for 27 years.

By the public at large, Carl Spatz is remembered as the commanding officer and guiding genius of the greatest aviation training center in history—the U. S. Army aviation school at Issoudon, France; and as C. O. of the Army's famous "Question Mark," which established a refueling endurance flight of nearly 151 hours, in January, 1929.

In the Officers' Club one will hear the legend retold of the "Mad" Major of the 2nd Pursuit Group going A.W.O.L., making unauthorized flights into Hunland and being suspected as a traitor and spy by the French high command. Treason, the French pointed out, was punishable only by death. It was regrettable that such a brilliant American officer should meet an ignoble end before a firing squad.

No wonder the French, quick to fasten the sting of suspicion upon everyone whose name had a Teutonic ring, were amazed when, instead of a firing squad's bullet through his chest, our government pinned a medal upon the chest of Carl Spatz. The legend of Spatz's "treason" is one of the most amazing off-the-record incidents of the World War.

WHEN the United States declared war against Imperial Germany, Spatz was the C.O. of the 5th Aero Squadron. He hoped to take his squadron to France. To his chagrin he was relieved of his command, ordered to France and given a schoolmaster's job. During the year he was Commanding Officer of Issoudon he trained and sent hundreds of pilots up to the Front. He would gladly have exchanged places with any one of them—even his gold oak leaves for the bars of a pursuit second lieutenant. Spatz bombarded headquarters with regular weekly requests for transfer to active duty at the Front. They came back indorsed, disapproved.

Within the veins of Carl Spatz flowed the fighting blood of heroic Pennsylvanian ancestors, who had fought and died at Valley Forge. He champed at the bit of military red tape that kept him bound to a swivel chair job. He yearned to serve his country as he was training fledgling pilots to serve—by fighting in a pursuit cockpit behind yammering twin machine guns.

Fighting pilots were needed at the Front. Didn't statistics show that the Allied planes were outnumbered 4 to 1 by the German Air Force? To hell with the honor and high praise he was receiving for

Major Carl Spatz, one of our most brilliant pursuit pilots during the World War.

a "schoolmarm petticoat" assignment. He carried his feud to the highest command. But America's early bird, who had seen service in the 1st Aero Squadron on the Mexican Border under Pershing, failed to effect a transfer to line duty.

Instead, in the late summer of 1918, Spatz was ordered to report at Aviation Headquarters, Paris. The military grapevine intelligence said that the major, with the German name, was to be sent back to the United States.

Also, there were rumors afloat that the American Forces would soon launch a tremendous offensive in the St. Mihiel sector. For weeks Spatz had been whipping novice airmen into fighting pilots. St. Mihiel was to see the greatest demonstration of American strength since the Stars and Stripes had come to France—an offensive, fighting movement. And Spatz would be on the high seas out of the war he so ardently yearned to take a man's part in.

One phenomenon of the World War, in reference to transferred American soldiers in France, was that in their traveling to report to new assignments of duty, all routes, by remarkable coincidence, led to the Front, via Paris. Spatz, ordered to Paris, reversed the tactics. Sensing that the big show would soon be over, he selected a route of travel that went via the Front.

It is related that Spatz, minus insignia of rank, made his way to the 2nd Pursuit Group at Souilly. The 2nd was composed of the 13th, 22nd, 49th and 139th Pursuit Squadrons. The A.W.O.L. major did not seek a desk job with the Group. The C.O. of the 13th was a graduate of the major's school at Issoudon. Spatz presented himself to the young captain, demanded a good serviceable pursuit job be put on the line as soon as possible.

Whatever the captain thought of the unusual request he left unspoken. A Spad was put on the line. Quickly Major Spatz was realizing the fulfillment of his greatest ambition. He was winging over Hunland! No thought was in his mind now that his flight was unauthorized, that he should be in Headquarters at Paris; that he was absent without official leave. Hell, he was where he had begged for a whole long year to be sent—at the Front!

This opportunity—to fight for the country his ancestors had shed their life blood for—was worth any sentence of a general court-martial. No general, no amount of red tape could bind him to a desk now. He was on the wing over Hunland! Then his private war waged against red tape was quickly altered to a war of a lone eagle—Spatz versus the entire German air force.

SPATZ'S mysterious disappearance created a tempest in official circles in Paris. "Mon Dieu!" an excitable French general cried with considerable wind up. Was not the major's name that of a German? Did he not speak German as he did English? Was he not ordered to Paris? Was he not here? He was not! Ah hah! It was all very clear.

France was over-ridden by spies. The major's disappearance was accounted for by this narrow gauge reasoning. The American airman with the German name and tongue had deserted! This meant disgrace not only for Spatz, traitor or spy (the excited French Army man couldn't readily decide which Spatz was), but for the entire U. S. Air Service.

The French needed only information from 13 Squadron that Major Spatz had taken off into Hunland without explanation or authority to back up suspicions with excited demands and accusations. A major at the Front, flying in a pursuit plane, when he could remain safely at a bomb-proof desk, must be bereft of all reason. The man was a lunatic or a spy, or vice versa.

The mad major—if he dared to return

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—should be court-martialed. It was a foregone conclusion that he would be found guilty. Oui, Monsieur le General, it was regrettable, but the firing squad would be the only way by which the face, the sacred honor, and the desired discipline of the U. S. Air Service could be maintained.

Spatz did return. But he only tarried at 13's drome long enough to request confirmation of a Fokker he had shot down in flames, and to have his ship serviced. Then he winged into Hunland again.

The C.O. of 13 had a walking stick of dynamite on his hands. He couldn't continue permitting Spatz to make unauthorized solo flights; confirmations couldn't be granted to a pilot who displayed every intention of remaining A.W.O.L. To forestall possible military police action the solution to the difficulty was to have the mad major attached to the squadron. An official inquiry could be conducted later.

The fervor and zest with which Spatz hurled his bristling pursuit job at enemy Fokkers quickly made him the outstanding fighter of Squadron 13. Mounting victories carried him rapidly toward acedom.

Then one of the strangest promotions of the war came to Spatz. A.W.O.L., at the Front when he should have been on a transport homeward bound, he was made Flight leader. A major holding down a 1st lieutenant's job, subjecting himself to orders of a squadron captain. That tells tersely that Spatz held the job of fighting in the air far above mere army rank. What cared he if a court-martial stripped him of his rank later? He was fighting, in the air, now!

MOST of Spatz's victories occurred too far behind the German lines and in rain and fogged-down skies to receive official confirmation. Let us study the terse, modest and laconic reconnaissance reports of Carl Spatz as copied in the War Department archives and reproduced, I believe, for the first time:

Sept. 24/18. Leader of flight. Altitude 3,500 meters. Weather fair. Time: 14:45—16:30. 5 enemy airplanes seen. Encountered none. Type seen: Fokker. Later at Lachaussen 4 pilots forced to land near Pont-a-Mousson. Rest of flight approached by 5 Fokkers at altitude of 4,000 meters. Combats rejected by us.

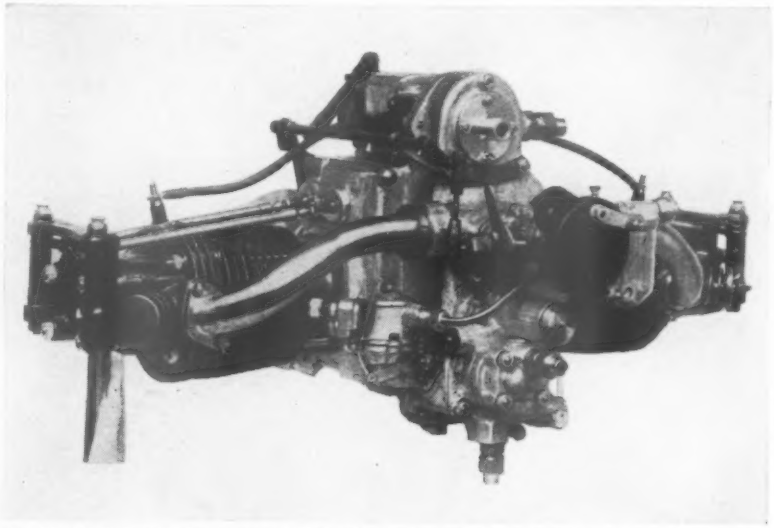
Sept. 25/18: Leader of Flight. Low patrol, 3,500 meters. Thescourt; Chambley. Number of enemy aircraft seen: 1 biplane, 3,000 meters; 2 Fokkers, 4,000 meters. E. A. disappeared north.

The French Air Officer had plenty of wind up by now. Tactically the situation was as follows: The St. Mihiel offensive was over. The Americans had wiped out the sector. The Allies, during that four-day battle, had regained supremacy in the air. Due to poor visibility, pursuiters had wrought havoc on the Boche ground forces by ground strafing. (No mention was made by the French that Spatz had led Squadron 13 in this dangerous and highly effective work.)

The U. S. Air Service had definitely won

(*Continued on page* 58)

Recent English Lightplane Engines



The "Sprite" 2-cylinder opposed lightplane air-cooled engine operates at low cost.

FROM across the Atlantic in Great Britain we have reports of two firms developing light aero-motors that are quite acceptable for private owners, both because of the low cost of the motor, and then the low operating costs.

One is known as the Aero-Engines Ltd., located at Kingswood, Bristol, while the second firm is the Carden Aero Engines Ltd., with its factory at Heston Airport, Middlesex.

Aero Engines Ltd. has brought out two versions of their product, the one designated as the Mark I Sprite which is equipped with a single magneto type ignition while the Mark II "Sprite" is equipped with dual magneto and also an impulse starter.

These two motors are alike in the other details of the construction, being of the air-cooled horizontal opposed type. The compression ratio of the Sprite is 6:1, the bore of the cylinders being 2.6 inches, while the stroke is 2.7 inches, permitting a total capacity of 70 cubic inches.

The maximum output of the Sprite at 3,150 r.p.m. is 24.5 brake-horsepower, while at the normal motor speed of 2,850 revolutions the power is 22.7 horsepower. The fuel consumption on this light engine is very low, the motor only using two gallons per hour at maximum throttle, while

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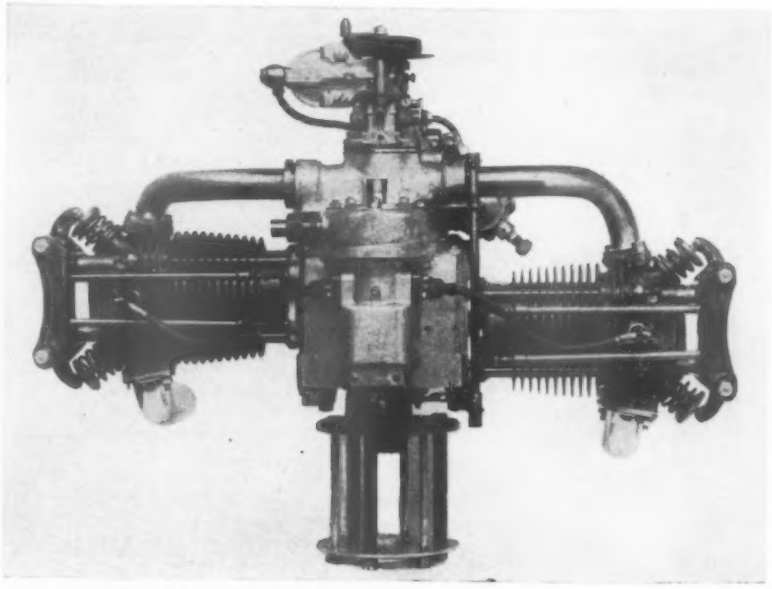


Plan view of the "Sprite" 2-cylinder opposed type engine.

The Fokker G-1 Le Faucheur

by
E. J. BULBAN

The Fokker G-1 Le Faucheur 2-Place attack bomber in flight. Note the double fuselage arrangement reflecting old Caproni practice.

RECENTLY, we have seen the modern bomber develop from a machine dependent on pursuit protection to a high speed, armored unit scientifically armed with heavy guns covering every possible angle of attack.

Extensive maneuvers, by every country, have proven the futility of ordinary pursuit planes attacking these battle-planes. Obviously a new type is needed if this menace is to be successfully combatted.

In Holland this problem has been solved by the appearance of the new Fokker G-1 attack. Incorporated in this design is a single seater performance with a crew of two, cannons, a perfect defense evolved by Fokker engineers and a long cruising range with the ability to carry a considerable load of explosives. Looking these points over carefully you can readily see that here is an ideal all-purpose machine.

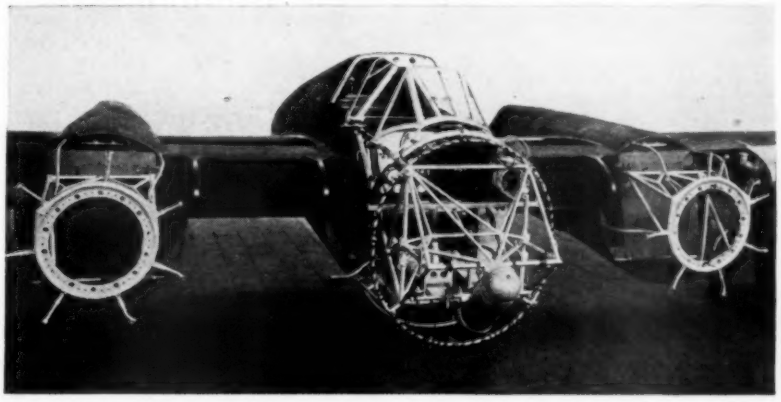
The G-1 is a mid-wing monoplane carrying a crew of two. It can mount two of any of several types of motors from 500 to 800 h.p., such as the Hispano-Suiza 80-02, Bristol Aquila, Bristol Mercury VII, etc. At present the plane has two Hispano-Suiza 80-02 engines at 750 h.p. each at 2400 r.p.m. at 11,500 ft.

They are enclosed in N.A.C.A. cowls with controllable cooling flaps, hydraulically operated. To start the motors compressed air starters are used in conjunction with a compressor mounted on one of the motors. The propellers are of the three bladed controllable type built by Hispano-Suiza under Hamilton Standard license.

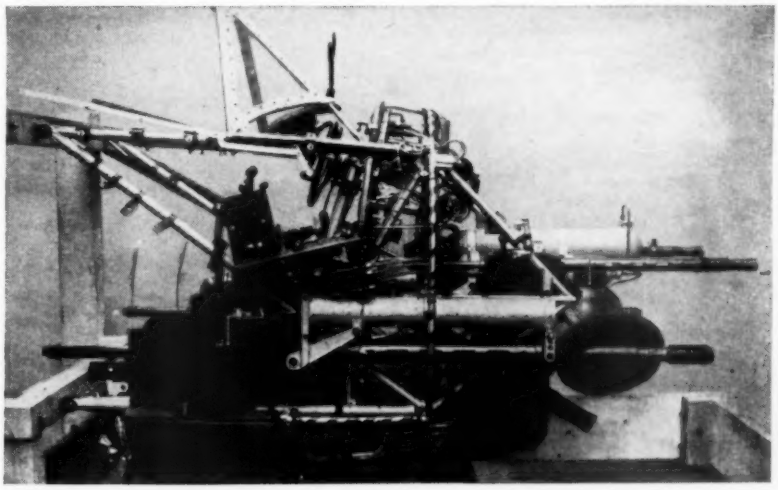
The fuselage is composed of two sections. The front half is of welded steel tubing covered with dural sheets with a nosepiece of sheet duraluminum attached to the tubular framework. The middle section is of plywood monocoque construction and it is this part to which the wing is attached. Mounted on the rear of the plywood section is a conical, rotatable gun turret which is principally a light metal skeleton with large "Plexiglas" windows, which afford the observer the best possible vision in every direction.

The pilot's cockpit, situated in front of the leading edge of the wing, is well provided with flight and navigational instruments. The levers for operating the flaps, landing gear, bomb rack covers are located here and also the differential controls for fixed machine guns and cannons.

Just behind the pilot's seat is a triangular framework of welded steel tubes, which serves as protection for the pilot should the plane turn over. Another handy feature is the roof of the cabin that can be entirely disconnected in an emergency. For



The engine nacelle beds and frame-work with the front part of the central fuselage uncovered. Note the very deep front wing beam.



The armament of the Fokker G-1 attack bomber. The upper guns are 7.9 mm. Madsens while the lower guns are 23 mm. Madsen cannons.

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ordinary entrance or exit the pilot goes through a window, hinged at the bottom, in the side of the cabin.

The comfort of the observer has been well looked after and his cabin is well padded so as to relieve any discomfort in rough weather. He is provided with a 7.9 mm. Madsen gun, with 1100 rounds of ammunition, which is mounted on a pivot in the tail turret. A camera may be installed for reconnaissance missions without undue trouble, or 882 pounds of bombs may be carried for bombing. The range as a reconnaissance machine is 1000 miles and as a bomber 685 miles. A telephone is installed for communication between the pilot and observer.

The wing is built integrally with the fuselage. It is composed of two box spars with spruce flanges and plywood ribs. The covering is of bakelite plywood, but if wanted, the wings can be of metal. They are of the same thickness between the motors and fuselage and taper from the engines to the tips. The ailerons are of welded tubes covered with fabric and are statically and aerodynamically balanced. Hydraulically operated wing flaps are installed between the wings and fuselage.

Outriggers form the tail supports. They are in two sections, the first part built integrally with the wing. This part is of plywood and forms the fairings for the motors and is also the housing for the retractable landing gear. The second section is of monocoque construction with dural frames covered with dural sheet. The vertical and horizontal stabilizers form one unit with the metal outriggers. The stabilizers have metal spars and dural ribs covered with dural plates. The elevator and twin rudders are of welded steel tubing fabric covered, and they are fitted with adjustable trimming tabs.

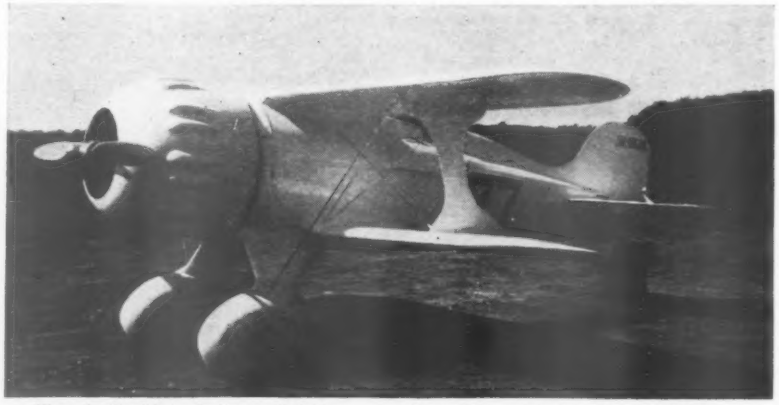
The landing-gear is attached to two reinforced box ribs behind the engines and it folds back, so that it disappears into the wing. The space between the two ribs is covered over by divided trap doors, which are automatically opened by the downward track of the wheels. The tail wheel does not retract but it can turn through 360 degrees and it can be locked in any position from the pilot's pit.

Fuel tanks are in the wings, between the

(*Concluded on page* 64)

Interior of the observer's compartment looking forward.

The Laird Super-Solution Flies Again



Here is the historic Super-Solution, once the pride and joy of the speed fans.

HERE'S Lieut. Joseph C. Mackey's new Wright powered Laird Super Solution racing plane test hopped at the Findlay airport by the newly crowned American inverted acrobatic flying champion.

On the straight-way it has been clocked at a speed well over 200 miles an hour. Lieut. Mackey says that it will hit 280 miles an hour with a racing type propeller.

This is the same ship the late Speed Holman flew to first place in the first great Thompson Trophy race at Chicago in 1930. It is the only American built Thompson winner to still be flying.

And So It Goes With Transoceanics

by MAX KARANT

LET us say that Colonel Joe Blotz has just "flown the Atlantic" from New York to London. Nine-tenths of the world's populace is agog and wild acclaim rings out for the Colonel wherever he sets foot. Everywhere he goes the more or less ignorant newspapers splatter the Colonel over their columns. Gum-chewing stenographers pant at the sight of the Colonel's picture.

"Gee," they generally gee, "ain't he just the biggest bravest handsomest man you ever did see?"

And the newspapers pick up where the gaping public leaves off:

DARING AVIATOR SPANS OCEAN SINGLE-HANDED! BLOTZ DEFIES DEATH TO REACH LONDON!

And so on. You and I have run the gamut of that sort of ballyhoo more than once and still the public falls for it. So let us take Colonel Blotz ahead on the calendar a bit and follow him to the next daring exploit he is sure to make—once the very profitable ballyhoo of his first escapade dies down.

Suppose now that the time is the present: 1937. The National Society for the Perfection of Tail Wheels has $100,000 or so, it doesn't seem to have much use for at present. Meanwhile, coincidentally, Colonel Joe Blotz is open to any offers; looking for a job, in other words. So the Colonel and the society get together. The society, it seems, understood that the Colonel long has had a hankering to do something about perfecting the airplane tail wheel for posterity.

Colonel Joe Blotz, the famed transoceanic airman, suddenly becomes Director of the Research Division of the N.S.P.T.W. He finds a job, in other words.

To make the story shorter, we will take it for granted that the N.S.P.T.W. has handed over to our imaginary hero the glistening new twin-engined transport which, with all its equipment, left some California manufacturer with a certified check for $80,000 in his pocket.

One morning soon after the Colonel officially took possession of probably the finest, most elaborately equipped airplane of modern days, said Colonel suddenly finds himself wondering what in the name of heaven he's going to do with this thing. A fast flight to N.S.P.T.W. headquarters, clouds of expensive cigar smoke over a conference table and a newspaperman-friend of the Colonel "scoops" the world the next day with the story that "Colonel Joe Blotz, world-famous this and that, will take off on a round-the-world flight at sunrise tomorrow . . ."

(All the above is imaginary. The remainder, to a certain degree, also will be imaginary. That, however, is just so that this "shoe" I describe here will not just fit the foot of one particular person—man or woman. Basically, however, the remainder is all too true, has been for years, and will be for many more . . .)

Colonel Blotz is delayed by weather the next morning. Of course, the newspapers devote plenty of space to the fact that he is waiting for the gods above to give him the starting gun.

Then, he's off!

Out over the Pacific he bravely and dar-

(*Concluded on page* 70)

Dope on the Lincoln Stunt Plane

by JESS LAUGHLIN

This little modification of the Nieuport biplane is exceedingly interesting because while retaining the old World War outlines it is equipped with a modern engine of much greater output than the original engine.

SIX thousand feet in 71 seconds from the take-off is the speed with which the Little Nieuport Biplane built by Garland Lincoln of Glendale, California, gains altitude.

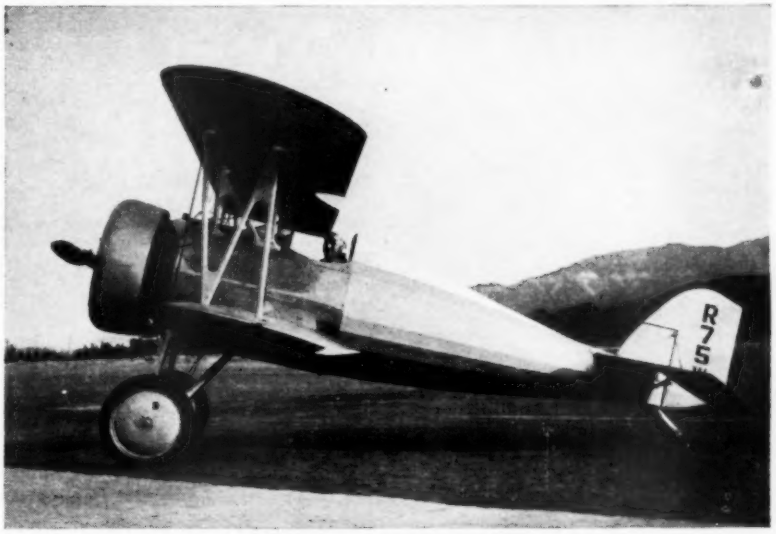
Built by Lincoln as the first of three of the same type for stunt work, and for moving picture work, this amazing little plane outperforms anything in commercal aircraft.

The fact that this little ship is powered with a Wright J-4-B engine whose rating is only 200 horsepower, and at 2,000 feet actually develops a maximum of 240 H.P., makes the plane's performance the more outstanding.

Hardly anything of the original Nieuport is left except its general outward appearance. The fuselage is still comparatively short, and the wings are well forward. These features and the old type landing-gear using the axle and spreader bar with shock cord, are what give it some of the outward characteristics of the wartime Nieuport fighting plane that performed so satisfactorily in the Great War.

Due to the fuselage being so short, the center of gravity is well forward of the position one normally expects in aircraft of today. The propeller now being used is a fixed pitch steel Hamilton. A more efficient wooden propeller is being installed, however, and it is claimed that the already impressive performance will be materially bettered. The new propeller will have a pitch of 22 degrees, and will produce less torque with a resultant increase in maneuverability.

The plane's designer claims that with the new propeller installed, he will be able to climb 6,000 feet in a flat 60 seconds as compared to the minute and 11 seconds now required.



Side view of the Lincoln Special with its builder in the cockpit. Note its resemblance to the wartime Nieuport.

By constructing the longerons and cross members of the fuselage of steel tubing, and having the diameter of the cross section of the fuselage 20 inches less than the outside dimension, a considerable saving in weight is effected. The outside surface is built onto the strong, rigid, boxlike construction that carries the stress and load factors.

Thus, the outside surface is composed of light stringers and formers that give the plane its streamline, and smooth fairing. The shorter cross members of the inside fuselage are, by reason of their shorter length, of greater strength.

The inside dimension of the pilot's cockpit is 24 inches, while the outside dimension measured at the same point is 44 inches.

WING CONSTRUCTION

The wing curve has been designed by its builder. Unlike any other type of known wing curve, it combines the best features of a number of recognized curves plus some of Lincoln's own ideas.

There is no angle of incidence or dihedral in either of the wings, but the way in which it is rigged will allow it to be flown hands and feet off, even in the inverted position.

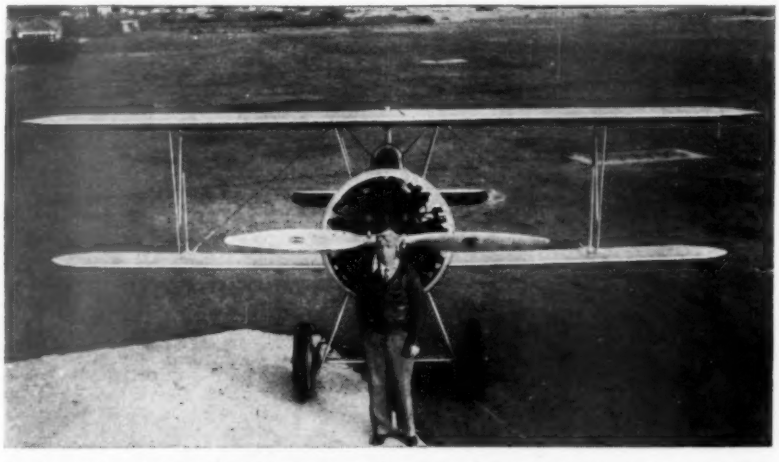
The wings have greater span and chord than the original Nieuport "28." The span of the wings is 19 feet, and the chord of the wings is 4½ feet for the upper wing, and 3½ for the lower.

The ailerons comprise almost the entire trailing edge of each lower wing. This amounts to three times the normal surface required; but according to Lincoln by doing this and having twice the amount of surface in the rudder and elevators over that normally required he has secured greater maneuverability.

There are certain stunts that are thus possible that would be impossible otherwise. For example: much tighter turns can be made. In a spin Lincoln has made 18 turns in 1,000 feet, and in level flight he is able to do snap rolls about the lateral axis of the plane rather than the corkscrew maneuver one usually sees when this stunt is done.

The wings have solid spruce spars. The wing loading is 7 lbs. per square foot.

"N" struts are used, and all external brace wires are at a 45 degree angle.



Garland Lincoln standing in front of the stunt plane. It presents a very clean appearance with the exception of the landing gear.

XUM

The vertical fin is offset 15 degrees because of the short fuselage.

The method of carburetion in this little ship is most certainly unique. When the plane has left the ground the carbureter is drained and the fuel feed is changed over to a fuel injection system not unlike that used on Diesel engines. The fuel is injected directly into the combustion chamber of the cylinder without carburetion, and the amount is controlled by needle valves.

The amount of fuel being injected is adjusted before leaving the ground so that the engine will turn over at 1,650 R.P.M. Any change in throttle setting now adjusts the amount of air entering the combustion chamber. This makes the throttle become a sort of mixture control. The range of adjustment is limited to 300 R.P.M.

It will climb either in straight and level flight, or in the inverted position by increasing the number of R.P.M. by 150, or by decreasing the R.P.M. the same amount it will dive. It is thus possible to climb or dive the plane without touching the stick or rudder bar.

It is claimed by Lincoln that this type of fuel feed is a great improvement in inverted flight over the old carburetion.

As the pilot and the engine are so close to the center of gravity, there is no variation in inverted flight. Because the center of weight stays near the center of pressure makes this possible.

With a top speed of 212 M.P.H. one might expect a relatively fast landing speed. Actually it lands at 58 M.P.H. at sea level.

SPECIFICATIONS

Top Speed.....212 M.P.H.
Cruising Speed.....180 M.P.H.
Landing Speed .....58 M.P.H.
Climb to 6,000 Feet.....1 Min. 11 Sec.
Climb (inverted) to 3,000 Feet
.....1 Min. 10 Sec.
Weight (Dry).....1,070 Lb.
Weight (with Full Fuel Load)..1,343 Lb.
Pay Load (Pilot, 175 & 'Chute 30) .205 Lb.
Wing Loading.....7 Lb. Per Sq. Ft.
Safety Factor.....6 to 1
Engine .....Wright J-4B

Garland Lincoln, Transport Pilot No. 2051, has 7,400 hours flying time. He soloed on March 22, 1918, at North Island, San Diego, and was attached to the 14th Aero Squadron. Before that he had enlisted in the Signal Corps of the Army. Later, after the war, he flew for Cecil B. DeMille and Al Wilson in a company owned by them, called "The Aero Taxi Service." Canuck Jennys were used.

Since then he has designed or rebuilt 18 planes for use in pictures. Among the many wartime ships that he owns is the only Wartime Orinco Bomber in existence. It was originally built by the U. S. Ordinance during the war.

Lincoln has made stunt flying for moving pictures and air exhibitions his livelihood. He supplements his flying by supplying the picture studios with wartime planes.

His ability as an aeronautical engineer is shown by the performance of these wartime planes that he has rebuilt or redesigned and rebuilt.

END

TAYLOR AIRCRAFT'S LATEST "CUB"

(See front cover)

Ideal for the sportsman pilot who wants to "go places and see things" is this Cub on floats which makes a haven of the remotest river or lake.

PILOTS ranging in age from 11 to 70 are claimed by the manufacturers of the Taylor Cub. One of the world's most popular light-planes, the Taylor Cub is shown in the accompanying photograph and on the front cover in its 1937 garb.

Primarily a runabout sport plane and trainer, the latest model of the Cub boasts a top speed of 85 m.p.h., cruises at 70 and has a rated still-air landing speed of 29 m.p.h., safe enough for even the most amateurish amateur.

Economy is a major factor in the Cub. Powered with the new four-cylinder Continental A-40-3, the ship's cruising gasoline consumption rating is three gallons per hour, making the actual operation of the airplane less expensive than a moderately-priced automobile.

This latest Cub is metal throughout with the exception of fabric covering and spruce spars in the wings. Much attention has been paid to the fact that the Cub is widely used as a trainer and accordingly has been built to meet the exacting requirements of student training.

"WHAT MAKES THE CAMSHAFT GO 'ROUND"

ENGINES Shop Instructor Ernest Camy of the Boeing School of Aeronautics was found by Photographer Clyde H. Sunderland showing Edward Sisul of Chicago the intricacies of a Pratt and Whitney "Hornet" engine which has been cut away for school use as a graphical illustration.

Sisul is the winner of the recent United Airlines-Boeing School of Aeronautics-Junior Birdmen scholarship for 1936 and now is attending the California aeronautical university for his award.

Adventures in the Thin Air

by

T. R. WISEMAN

The Douglas photographic plane with camera, stratospheric masks and parachute. This is the equipment employed in the flights described.

AWHILE ago when Wiley Post was first preparing to streak through the stratosphere in his "Winnie Mae," a scientist came forth with the profound remark that men who worked in the stratosphere all the time were bound to suffer from oxygen jag caused by too much of this life giving substance.

It is true that many of the men who make stratosphere pictures—flyers whose business takes them into the "thin air" of the outer atmosphere, suffer at times from depression headaches and low vitality. Knowing this to be true, it seemed possible that this scientific man had grounds for his theory that too much oxygen would make a man brutal and devilish.

Among photographic flyers, this has become a standing joke—for although oxygen, taken after a period of "thin air," tends to exhilarate and uplift the depressed spirits of the flyers, there was little reason to think that more brutal instincts were heightened.

We used oxygen masks recently on Government maps surveys. One of these, the smallest of all, turned into a regular Old Man of the Sea.

Since it seemed to be "open and shut," Noel (Red) King, a cub who had never been alone in charge of a job before, was told it was "his to do." All the flyers, "Slim" (G. Watson) Babbitt and Dick McCoy, as well as Noel, were from Denver and were experienced in mountain flying and stratosphere photography.

The Blue Ridge Mountains, where this project was located, did not seem much more than foot-hills to these men who were used to flying the high altitudes of the Rockies, although the project was to be flown from twenty-thousand feet in the air, to take care of irregularities of contour.

The devil was in the contract, however, for although apparently a "sissie" job, it turned out to be the most difficult job that we had handled, and the one on which we encountered the greatest personal danger. Most of these special dangers seemed to hinge on the oxygen—vitally necessary for working at that altitude.

The outfit had been advised to use oxygen masks and to "smoke" only when necessary, to avoid burned lung tissue. Many of the men were afraid to smoke enough oxygen on account of the cold. This was needless caution, however, although the temperature at that altitude was four or five degrees below zero most of the time—by the time the oxygen reached their lungs it was warmed slightly.

Many of the boys felt pretty rotten when they got back on the ground. They complained of headaches—depression and exhaustion—and blamed their ills on too much oxygen. This seemed right in line with the conclusions of the theorists who believed too much oxygen would burn up your energy and produce an oxygen jag.

These oxygen tanks were filled with a specified mixture, intended to approximate as closely as possible the elements of pure air. This, of course, took care of the danger of burned lung tissue and frozen lungs—as long as the men used reasonable care. The tanks were filled under pressure by chemical companies and the containers were similar to those filled with ether and straight oxygen for hospital use.

The field base at Winchester, Virginia, was twenty miles ground distance from the point at which the photographic work started, so that in flying from the base to the beginning of a strip, twenty thou-

Far below is seen the smoke from the shell burst and the dense shadow behind it.

XUM

sand feet high, it took as long as forty or fifty minutes to get in position to work.

The crews usually waited to adjust their masks until ready to start flying the strip for pictures. The ships carried only enough oxygen for four hours work and if the tanks ran dry while on the job a loss of precious flying time resulted. To avoid re-photographing the entire strip, once started, it must be finished.

Contrary to the theorists, Slim Babbitt and Dick McCoy figured out that there was no such thing as an oxygen jag. Said Slim—

"Nobody ever got too much pure air—and that's what this stuff is supposed to be. The other birds must be starving themselves, rather than bother with the masks!"

As a proof, he pointed out that half of that first forty minutes off the ground was spent above ten thousand feet—an altitude where masks are ordinarily used for any lengthy flying. So the crews were really badly in need of oxygen before they were ready to connect up their oxygen tanks for breathing, and in place to start flying the strip.

As soon as the masks were adjusted and the air mixture coming through, the fellows noticed that they felt very lively for a time. Before this they had felt tired out—depressed—reckless and languid. Slim concluded that if they arranged matters so they could "smoke" without the fuss of stopping to adjust their masks, they would avoid the "starved" period.

One day Slim and Dick, who had taken a good deal of razzing for their theory, decided to take off their masks and "smoke" the stuff directly through the tubes. Dick had a small mishap—which both Slim and he stoutly affirmed was no fault of the theory. "It was an accident!"

The tube slipped from between his teeth and touched the lining of his mouth. The oxygen burned a blister. Dick became very sick because the oxygen entered his bloodstream by this blister instead of going through the usual lung process. Slim had no ill effects and never suffered from headaches as the other boys did, because he always had the oxygen ready to use without trouble.

One day, when Slim and Red were nearly through flying for the day, Slim noticed the oxygen getting low—by the lack of pressure—and signaled to Red to change tanks when they got ready to start down the next strip. Waiting drowsily, after he had the ship in position for the next set of pictures, he noticed after the hook-up was complete, that he still didn't feel any peppier. Removing the hose from his mouth he listened to hear the hiss of escaping oxygen—and there was no hiss!

The new tank was empty. They still had a reserve tank on board—and luckily this next strip was the last they would have time to shoot before the light changed. Otherwise they might have lost a good half day of camera work because of a lack of oxygen. It took a long five or six minutes more to make the second change, and hook up the reserve tank, and both men nearly choked to death before they finally got a good deep lungful of oxygen.

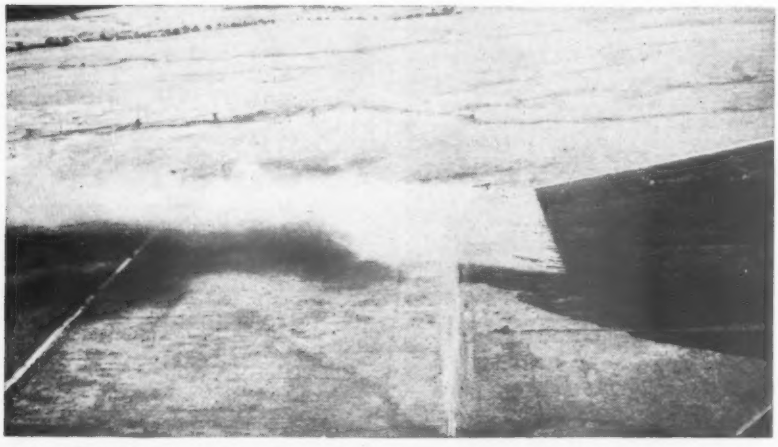
All hazards were not through the hose of the tanks however. One day a new plane, which Slim was flying, developed engine trouble at the ceiling. It looked as if they'd be crowding the daisies in a minute or two for the field was twenty miles away as well as twenty thousand feet down. Most of that country is decked out in tree stumps and rocks. You can't pick soft landings when you're that high up.

Red held his ears and yelled bloody murder, and Slim felt as if a package of firecrackers were going off in his head, while he dropped the ship eight hundred feet a minute. He knew he'd have to hunt a parking place right now, and it had to be a quick drop if he was going to save any power to flatten out in a circle and glide in on that sputtering engine without cracking on stumps and rocks.

In his glide Slim managed to pick up a cornfield and they landed without any broken bones. The landing gear on the Cessna was cracked up and Slim and Red couldn't hear a thing for an hour or so. It seems quite possible that a man could have a bad case of "bends" such as deep sea divers suffer if he fell out of the stratosphere into normal air pressure too quickly.

Toward the last of the season when time was exceedingly short and the job

(*Concluded on page 62*)



This stuff looks nice and smooth and cozy from where this photograph was taken. But a forced landing here would soon tell a different story. It takes a good pilot to find the smooth spots.

WOW! LOOK AT HIM!

by HELEN WATERHOUSE

Imagine this husky gentleman aboard an airliner!

AIRPLANES are the best mode of travel for giants, so Martin "Blimp" Levy, champ wrestler from Boston, believes.

The 650 pound giant who visited Akron recently, says that he almost always travels by plane in making his trips 'round the country, not only for speed, but also for his own personal comfort.

In other words sleeping berths on trains are scarcely designed for a man who is seven feet around his waist and who is said to be the biggest man in the world, although not the tallest, since he is only six foot one in height.

He admits that the doors to planes are sometimes a tight squeeze, but he manages to maneuver himself through them somehow and once within is perfectly comfortable in a front seat. True the safety strap won't reach around his waist, and he has no lap in which to hold a tray of food, but with the aid of the stewardess, he manages to get his meals all right, and after all that's the most important thing in the world to "Blimp."

The Boston behemoth who first attracted public attention as a parking lot attendant who could carry the cars into place—almost—says that his first thought on awakening is always food. He thinks nothing of consuming from two to four steaks at a meal. He eats but one meal a day, he says, and that's one continuous meal, so that the dainty sandwiches and olives of the airline menu just serve as an appetizer for a meal at the terminal as soon as he arrives at his destination.

His one bad airplane experience was recently, when he went to purchase his ticket for a trip from New York to Chicago. The airline officials said that he would have to buy two tickets, since he practically takes the space of two people in the plane.

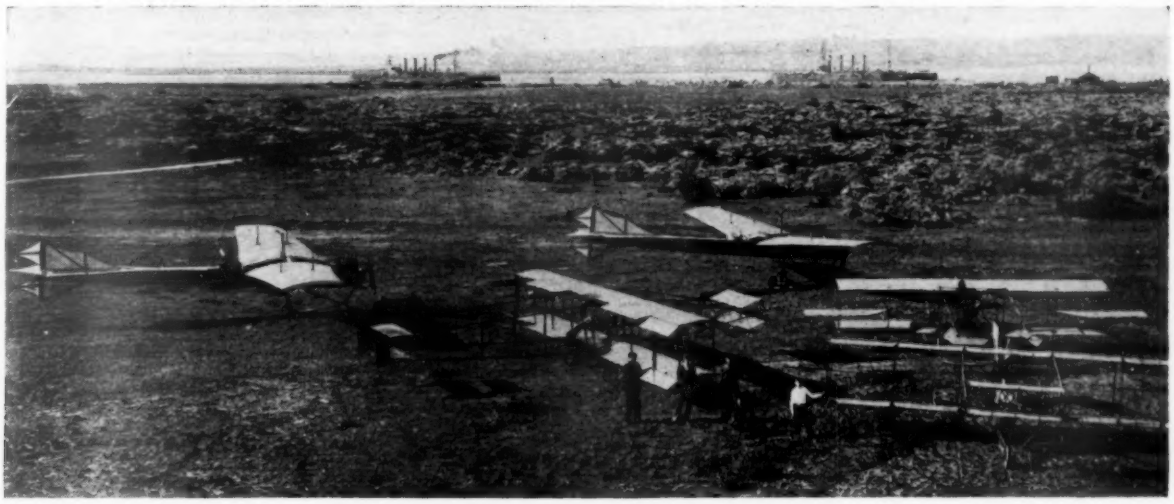
"I rebelled at that," said Blimp. "I told them I'd pay both fares but that I'd sue the company for discrimination afterwards. So they decided to let me go for one fare."

XUM

"Doc" Wildman—Noted Early Bird

by JOHN WATKINS

"Doc" Wildman, the subject of this article, was one of the best known of the early pilots and was one of the first two men to fly over the Atlantic in a landplane.



Here is an old time view of Curtiss Aviation field in 1911, now the North Island Naval Air Station. Two Antoinette monoplanes will be seen in the background and three Curtiss training planes nearby. This is a rare old photo, well worth preserving.

ONE by one they go, those pioneers of flight. Curtiss, Bleriot, Wilbur Wright—all have passed on, and few remain to tell of those carefree, reckless days not so many years back. But some remain; some famous and others, who contributed just as much, still unknown and unsung.

A little more than thirty years ago, in the days when a man professing an interest in aviation was considered a crack-potted simpleton by his more conservative associates, a young man named Frank Wildman climbed telegraph poles for a living, and as a hobby worked on the crude automobile and motorcycle engines of those days.

Today that same young fellow—not much older in appearance, just a little grey, and just about as active—is one of the ace airplane power plant engineers in the country. He's working at Wright field, in Dayton, O., helping develop better aircraft engines for the army air corps, and winding up an illustrious career in a profession which has been his since he met Glenn Curtiss in 1906.

Over these past thirty years, "Doc" Wildman, as he is known to thousands of men and women in the aircraft industry and the army air corps, has accumulated a series of records which are the envy of every old timer still in the business. He has gained the respect and admiration of men whose very names themselves are a history of aviation.

Wildman was one of the first two men in history to fly over the ocean in a landplane. He was test pilot of the first flying boat; holds the first altitude record set by a hydroplane; and was the first man to make a night flight in any type of aircraft.

Yet, when he first became associated with the fledgling American aeronautical world, he had no desire to fly, and it took four years of constant association with some of the most famous pioneers of flight to create in him the urge to learn to be a pilot!

The Aeronautical Experimental Society had been formed at Hammondsport, N. Y., early aviation center, by Glenn Curtiss and such famous veterans as Dr. Alexander Graham Bell, inventor of the telephone; Capt. Thomas W. Baldwin, America's first and most famous dirigible pilot; John McCurdy, whose feats of flying need not be repeated here, and Lieut. Alfred Selfridge, who achieved the sad distinction of being the first casualty after America got her wings. Mrs. Bell was there, too, and because of her great interest in the experimental work, contributed $30,000 of her private fortune to the society.

Each man set out, in his own way, to build an airplane, and Curtiss hired young Wildman, who climbed down from his telephone pole to become, in effect, the world's first professional airplane mechanic.

On Wildman's capable shoulders fell the mechanical details of the experimentation And literally did those details seem to fall; the only mechanic for the entire group, he had his hands full, and his conscience, too, because on his work partially depended his employers' lives.

The story of what those pioneers did on the lake at Hammondsport needs no repeating. Suffice it to say that some flew and some didn't. But out of the group emerged Glenn Curtiss, whose name is destined to live forever in the annals of aviation.

After learning to fly and acquiring the little knowledge then available of the principles of flight, Curtiss began building airplanes professionally, and Wildman remained with him. By this time, he was a full-fledged aeronautical engineer, such as they were in those days.

It was this young fellow, self-taught, who developed the eight-cylinder air-cooled engine with which Curtiss winged his way in to win the *Scientific American* cup in 1908. Already manifesting great genius in such matters, Doc later converted the engine to the water-cooled type, and with it Curtiss won the Gordon Bennett trophy a year later, in France.

While in Europe with Curtiss, Wildman conceived the idea of a new and greatly improved airplane power plant. Thus was born the famous Curtiss OX motor, which powered the equally well-known "Jennie" of World War fame, and still is occasionally seen on some youthful dare-devil's home-made sky flivver.

In those days an airplane pilot was an exceedingly romantic sort of a fellow, even if many people still considered him of the circus-acrobat type. Wildman was still young, and it was only natural for him to envy Curtiss and the other pilots, who careened through the sky while he remained prosaically on the ground. It wasn't long before he began to succumb to an inner urge, and decided to learn to fly. He had been aloft, of course, even in Captain Baldwin's dirigibles with their flapping canvas propellers, but for four years he had successfully overcome both his own mounting desires and the best efforts of his associates.

So in 1910, he decided to take the fatal

step—and the word "fatal" could have been very literal in those days. Curtiss furnished the ship, and Baldwin supplied a few pointers, but it was up to the young engineer to teach himself, because then there were no veteran instructors in the front cockpit, equipped with inter-cockpit telephones so they could give the timid student a few steadying words of advice. All Curtiss and Baldwin could do was say, "Here's the ship and there's the field. Go to it, son, and, God willing, come back a pilot."

"With a lump in my stomach, and a dry mouth," Wildman smilingly told the writer in his office not long ago, "I tied the throttle according to instructions so the engine wouldn't race the ship into a premature take-off, and then I had just enough power to bounce around and 'cut grass,' as we used to express it. I bounced her off the ground a few times, just to get the feel of the controls, and then I figured I was about ready.

"I untied the throttle and gave her the gun. Before I could catch my breath, I was in the air and was a pilot. At least, it seemed like that."

After spending a few months practicing his newly-learned art, Wildman became just about as accomplished as a pilot could be in those days, and joined Curtiss' hard flying group of aerialists, who toured the country giving the darndest exhibitions anyone has seen or heard of since. Their old crates shivered and shuddered across the sky at forty miles per hour, threatening every second to fold up and take the pilots with 'em, and often doing just that.

Wildman lived through it—being a little more fortunate than some of the early birds—and reached such a high point of skill that in 1911 he became Curtiss' chief test pilot. Naturally, this was a doubtful honor, being a good deal more precarious than test flying is even today, because of the hit-or-miss fashion in which airplanes were then built.

At this time Doc unwittingly became embroiled in aviation's greatest feud, when he flew the reconstructed Langley airdrome. After the unwieldly affair was rescued from the Potomac river, into which it promptly dived after being launched from a houseboat on its first test, it was taken to Hammondsport and there rebuilt and actually flown. As a result of those tests, the Smithsonian institute in Washington maintained that Dr. Samuel P. Langley built the first airplane capable of man-carrying, sustained and controlled flight, rather than Orville and the late Wilbur Wright.

The Wright brothers are now given their rightful credit for their achievement, but it was not acknowledged by the institute for years, and as one result, Dr. Orville Wright, bitter and disillusioned, loaned the world's first successful airplane to London's South Kensington museum, and there it remains despite the best efforts of interested persons to have it brought back to its own country.

But Wildman flew the airdrome in the tests on which the institute based its claims, and he emphasizes that it definitely was not the craft which Langley first tried to fly. It was rebuilt and modified, and even then was hardly capable of controlled flight, Wildman says, although he did bounce it off the lake for short, low hops.

Wildman sits in his office at Wright field. A few miles in one direction is the neglected, weed-grown and battered hangar in which the Wright brothers worked on their early ships. Not much farther away, on the opposite side of Wright field, Dr. Wright, a sad-faced old man, goes every day to a little brick laboratory on one of Dayton's side streets, and there works out modern aeronautical problems.

These two men, who would have so much in common, have never met. It would be interesting if they could know each other. Perhaps it might lead Dr. Wright to reconsider his decision to let the first airplane remain, for the present at least, in England. But that is the present, and we must get back to the past:

As chief test pilot for Curtiss, Wildman began as early as the year he got the job to start breaking records. In his long list of achievements, No. 1 was flying the world's first flying boat. It was not a hydroplane, with pontoons, but actually had a hull. Curtiss' contract with his backers forbade his flying, so Wildman did most of the early test work, of which piloting the boat was a part.

In the same year, 1911, Doc and John McCurdy undertook a very momentous and dangerous flight. Taking off in a Curtiss landplane from Key West, Fla., they turned the nose of the ship toward Cuba. Popping along through the air, with nothing but ocean to land in, they headed for Havana. Just as the colorful buildings of Havana loomed up over the horizon, the engine conked and the boys fell into the ocean, only six miles from their destination.

It was another case of the navy to the rescue. A gunboat fished Wildman and McCurdy aboard, little the worse for their ducking, and immensely proud of covering nearly ninety miles of treacherous sea in a little better than two hours and a half. Theirs was the first over-water international flight from the United States, and was virtually a success, of course.

Before the close of that eventful year, Wildman hung up two more records. On one bright day he became the first man to establish wireless communication between an airplane and the ground, and before he had climbed wearily into bed, made history by flying at night for the first time.

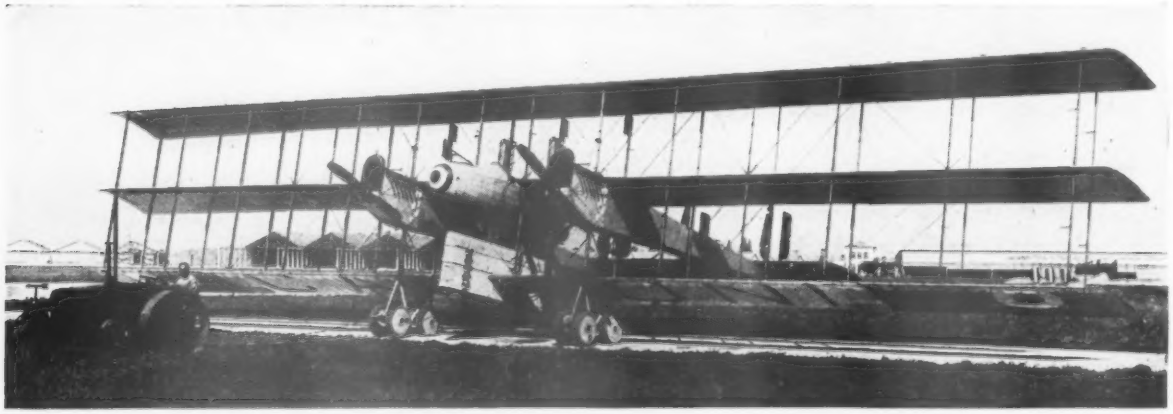
Had the flight been a failure, it would have been more interesting, but success is often dull, and all Wildman can recall of it is that he took off from the lake at Hammondsport, and flew in the dark, with nothing to land by but two lights on the pier and five thirty-candlepower bulbs mounted on his wings.

Late in 1912 there came another era of prosperity and affluence for the irresponsible young aviator-engineer. He was sent on what amounted to a world tour in behalf of the Curtiss company, and thereby became one of the world's first airplane salesmen. He had an interesting time, and gained a very poor opinion of the United States government's attitude toward aviation, as compared to that in Europe.

"I didn't have much competition abroad," Wildman remarked. "I found that especially in Europe, and Russia in particular, the people and the government officials were very airminded. It was a lot different there than it was over here, and the contrast was very noticeable.

"People in America went to aerial circuses and went away not believing what they had seen. Europeans went to the same kind of shows—most of them not as good as ours, incidentally—and went away

(*Concluded on page 57*)



A note from bygone days—A Caproni triplane having dimensions comparable with the largest modern commercial transports.

Details of the Beechcraft Model 18

by M. R. CULLEN

This new ship, known as an "executive transport," is the latest addition to the Beechcraft line. It is a vest-pocket bi-motored transport type.

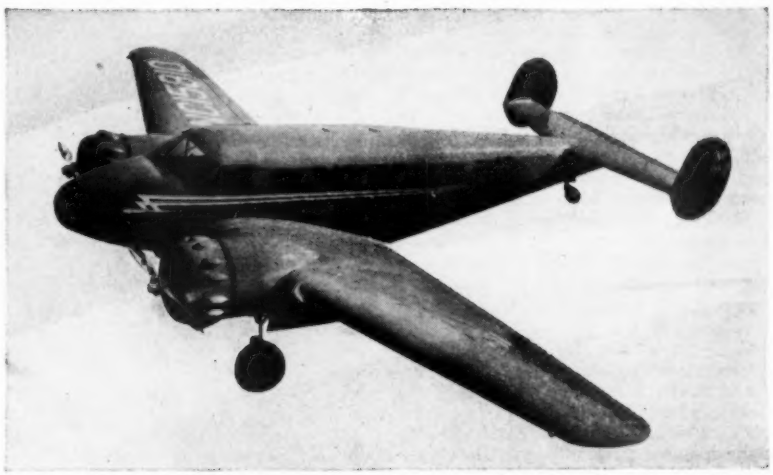
THE new Beechcraft Model 18, executive transport, has been completed and fully tested to the complete satisfaction of its designers and builders.

Work was begun on this plane more than a year ago, after Mr. Beech had conceived the idea that the field of commercial aviation was lacking in one type of ship for which there was a considerable demand. Several of the larger factories were producing splendid ships of the transport type but not any of the size and design of the Beechcraft Model 18.

In outward appearance, this new Beechcraft has all the earmarks of the conventional twin-engined transport. However, there are several basically new design innovations that distinguish it from all others. This is true because the original specifications were not drawn until a wide survey among prospective users disclosed the important requirements that would have to be met in building this type of plane.

Important things to be considered were low first cost, low operating cost coupled with long flying range, cabin comfort and safety comparable to that found on airliners, ability to operate from small fields and a structure which can be repaired in shops outside of the factory. These had to be met without sacrificing a relatively high cruising speed.

The Model 18 is a twin-engined, low wing, cabin monoplane of all metal semi-monocoque construction having an electrically retractable landing gear and tail wheel. Standard seating arrangement provides for six passengers in the cabin and two pilots forward. Standard power equipment consists of two Wright 760-E-2 seven cylinder engines having a total of 420 hp. for cruising at 11,500 feet and with 700 hp. for take-off, or, two Jacobs L-5 seven cylinder engines having a total of 420 hp. for cruising at 8,000 feet and 600 hp. for take-off.



The Beechcraft Model 18 in flight. Note the wide angle of vision with no blind-spots on the ground while taxiing or in flight.

The club interior arrangement of two easy chairs and a long, comfortable lounge offer unusual comforts. The utmost of pleasure and safety for the traveler is insured by completely modern sound-proofing, heating, and ventilation in a cabin fitted all around with safety glass. A separate compartment encloses complete rest room appointments and an outlet for an electric razor.

The construction of the fuselage is largely on a conventional pattern. It consists of built-up bulkheads to which are fitted extruded section stringers with smooth skin riveted to both. This arrangement is used for all sections of the fuselage from the nose to the stern.

The wing panels are of simplified design. All severe bending stresses are carried by a heat treated welded tube monospar which bolts to the center section beam. This member extends through all critical sections of the wing and about half way to the tip is spliced to a dural girder.

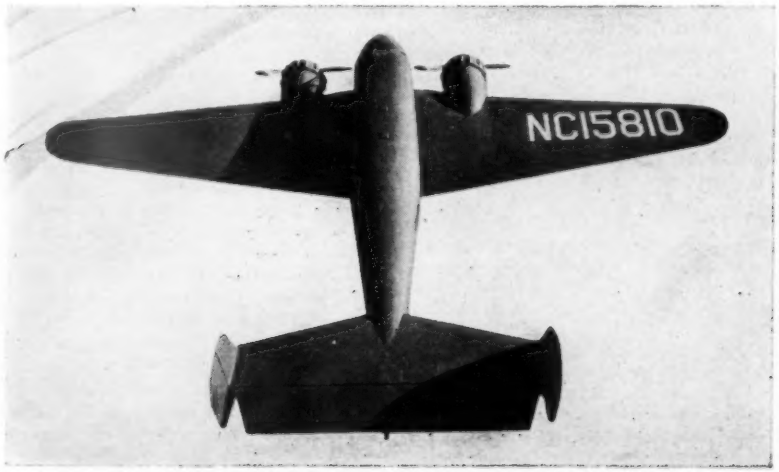
The ailerons are of conventional dural sheet construction having fabric covering. A trimming tab is mounted on the left aileron only. The aileron type flap is also of the same type construction. It is electrically operated. The tail section consists of a conventional semi-monocoque stabilizer and dual fins. The rudders and elevator are built of welded tube covered with fabric.

Repairs to the engine mount and landing gear fittings may be made by ordinary mechanics without endangering the heat treatment of the steel spar. Due to the general design it is possible for service stations to repair practically any part of the ship by use of usual tools and standard, easily purchasable materials.

The retractable landing gear is of simple design and construction. Basically it consists of a single forked leg to which is attached an arm. One end of the arm slides on a tube inside the nacelle, and when the gear is retracted the leg swings backward into the nacelle. When the gear is down the arm acts as a drag brace for the leg.

The air oil shock absorber has a vertical travel of eight inches and this combined with Goodyear 28x13x5 low pressure tires will allow a landing descent rate of 600 feet per minute without exceeding two-thirds of the design load.

The type of tires employed also facilitates take-off and landing in soggy or



Looking down at the Beechcraft Model 18 discloses unusually clean lines.

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sandy fields as they reduce tendency to bog down, even when carrying a full load. Both landing-gear and tail wheel are electrically retractable in four seconds and may be operated by hand crank in emergency. Brakes are actuated by hydraulic pressure.

Despite the economy of power the performance figures are high. With Wright engines the cruising speed is 185 m.p.h. at 11,500 feet, with an initial climbing rate of 1,250 feet per minute. With one engine the plane will climb to an altitude of 8,500 feet. Carrying six passengers, two pilots, 300 pounds of baggage and 125 pounds of equipment the cruising range is 475 miles.

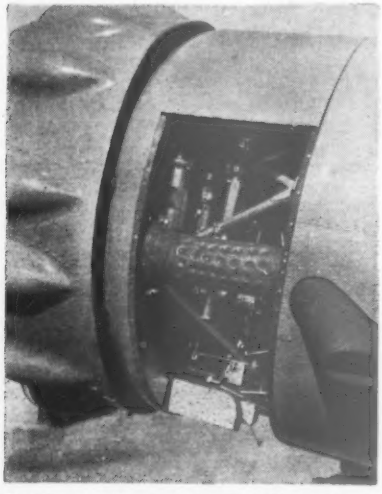
With two Jacobs engines the cruising speed is 180 m.p.h. with an initial climbing rate of 1,200 feet per minute. With one engine the ceiling is 8,000 feet. The gasoline consumption for both makes of engines at cruising revolutions is only 35 gallons per hour. All altitude figures are given from sea level.

SPECIFICATIONS

Span	47′ 8″
Length	31′ 11″
Height	9′ 5″
Landing gear tread	12′ 11″
Gross weight	6,500 lbs.
Empty weight with standard equipment:	
Wright engines	4,100 lbs.
Jacobs engines	3,920 lbs.
Power loading based on take-off power:	
Wright engines	9.29 lbs./h.p.
Jacobs engines	10.83 lbs./h.p.
Wing loading	18.7 lbs. sq. ft.

Walter Beech's entrance into the small transport field comes after several years of exclusive single-engined private airplane construction. All Beechcrafts previous to the 18-K have been single-engined biplanes with negatively-staggered wings.

Fertile Beechcraft market is foreign countries and the Beech export market is an active one. Single-engined Beechcraft cabin biplanes come powered with Jacobs and Wright engines of varying horsepower ranging from the 285 h.p. to the 420 h.p. Whirlwinds. All are four- or five-place machines. The largest ship, powered with the 420 h.p. Whirlwind, rates a cruising speed of 202 m.p.h. and a landing speed of 50 m.p.h.



Engines on the new Beechcraft transport are easily accessible.

NEW INERTIA TYPE VIBRATION PICKUP

SO sensitive that it will pick up the vibrations from the escapement of a wrist watch, yet so rugged it will withstand vibrations up to 1/16 inch amplitude, is a feature of the new Model 156 Sunco Inertia Type Crystal Vibration Pick-up.

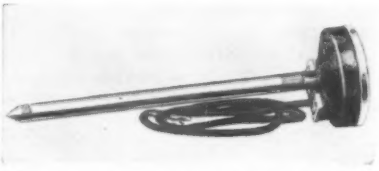
The bimorph crystal used in the Model 156 is mounted inside of the aluminum case and has no direct mechanical connection with the prod. When the case (which weighs only 4 oz.) vibrates, the crystal flexes of its own inertia and sets up voltage impulses of exactly the same wave form as the mechanical motion.

The response is practically linear up to the resonant frequency of 2,500 cycles. The output sensitivity is relatively high—2 volts R.M.S. with .001 inch motion at 400 cycles per second. An 8 inch duralumin test prod is provided.

The Model 156 Pick-up is used in connection with the Model 150 Neobeam Oscilloscope, which has a built-in amplifier and a voltmeter on the output, to determine the frequency, amplitude, and velocity of vibration.

Since the voltage output of the Model 156 varies as the square of the velocity and the vibration energy also varies as the square of the velocity, the voltage, as read from the output of the Neobeam Oscilloscope amplifier, is a direct function of the energy. In comparing very small vibrations, such as watches, etc., they are made audible with the speaker attachment shown in the illustration.

A partial list of applications on which vibration study with this set-up may be used includes: Production testing of electric motors, ball bearings, crankshafts, gear trains, fans, air conditioning equipment, and locating source of vibration in reciprocating or rotating machinery; checking relative smoothness of surfaces, such as paper, polished metal, gauges, glass plate, etc., checking longitudinal rods for fracture, and the relative efficiency of materials for deadening sound.



The pickup instrument (prod).

. . . so sensitive it "feels" a watch.

. . . so rugged it withstands shocks.

TESTS ON COLLOIDAL GRAPHITE LUBES

ALTHOUGH many are familiar with the advantages of colloidal graphited crankcase oil in the reduction of cylinder wear, a test recently carried out by the Research Department of the Institution of Automobile Engineers (London, England) has produced authoritative figures to endorse this view.

During the test, two new engines were run and left standing during alternate 15-minute periods. In addition, during the running time, each engine was revved at 1,000 r.p.m. at light load for five minutes and at 2,000 r.p.m. and a medium load for the remaining 10 minutes.

These alternate running and rest periods were repeated 30 times and the piston rings then measured. It was found that the wear of the engine lubricated with plain oil was 50 per cent greater than in the engine using oil containing Acheson's "dag" Brand Colloidal Graphite.

The tests were continued for a further 150 cycles and measurements again taken. The curves of wear which were plotted as a result of the test showed a clear difference between the two lubricants—the engine with the colloidal-graphited oil showing constantly about one-half the wear as when lubricated with plain oil.

Piston ring rather than cylinder bore wear was recorded for it can be more simply and accurately measured. The actual method adopted was to weigh the rings and to check the results by analysis of the metal in the crankcase oil.

Colloidal graphite, naturally, does not replace the properties of a good plain oil. What it does is to "take the strain" of lubrication when bearing conditions are most severe. That it can supplement the properties of an oil in this way, especially during running-in, seems to be proved by the I. A. E. tests.

One major function of colloidal graphite lubricants is that it remains in the engine bearings even after regular oil pressure drops off. This keeps the engine from "freezing" and causing serious damage.

"....Clear and Unlimited"

by SWANEE TAYLOR

And now the prodigal son has returned to his regular beat to instruct, amuse and entertain his fans with candid observations on the industry at large.

NOW that our new baby, beautiful little POPULAR PHOTOGRAPHY, is born, christened and sent forth into the world we can turn our attention once more to the aviation scene. To those of you who missed *"Clear & Unlimited"* last month, my heartfelt thanks and deep appreciation. I'll try not to stay out any more.

Private Enterprise

Hard on the heels of the February National Air Show came the heartening news that Vincent Bendix had bought up the airport properties across the Hudson at Teterboro, N. J. Where, according to the loquacious but otherwise accurate Harry Bruno, soon will rise a Bendix Air Centre somewhat along the lines of gargantuan Rockefeller Radio City.

Yet it was strange what little effect this excruciatingly important announcement had both on the press and the public of our town. The newspapers, of course, reported the news, as it becomes them to print all pronouncements from the mouths of mighty Industrialists who advertise. Foolish New York, however, just skipped along its usual blithe way utterly unmindful of the story's true import—and the vast benefits in store!

Here, briefly, is what the Bendix Air Centre will mean to Father Knickerbocker. An air depot at long last located at a sensible distance from the hotel and buying districts. Or, to give a clearer idea, the weary skyfarer will be able to scoot across the Jersey meadows, through the new midtown tunnel into the restful charm of his favorite cocktail lounge—or burlesque show—from fifteen to eighteen minutes after landing. No more, happy to say, will it be necessary to take a rubber-neck tour through the most uninteresting part of the city to get to and from the airport.

Incidentally, a telling moral may be had in this latest Bendix enterprise. Namely, the evident need for this country to select a certain few Rugged Individualists and hang onto them for dear life. For, in the above instance we see where one Big Business Baron in the waggle of a pen was able to accomplish more aeronautical good for the community than all the pee-pul's servants combined. Which includes the Hon. Fiorella H. (Little Lily) LaGuardia, our municipal firecracker.

Let who will rave all they want about concentrated wealth and frozen assets. But I for one don't believe that just because Vincent Bendix can scratch off a check for three million bucks, and make it stick, brings the Revolution even a day closer.

AS per my promise, I herewith print an answer to that recent open letter to the Radio Manufacturers of America. This one is from Charley Planck, of the Washington Institute of Technology, and he covers the ground pretty thoroughly, not to say interestingly. He says, in part:

See what Swanee had done to himself during his vacation—pipe the smile!

"Dear Swanee: The curious public has a right to know our answer to your letter to aircraft radio manufacturers . . . It is probably true that aircraft radio does lag behind other fields of aeronautical progress. It is likewise true that this is to be expected, since radio is a far younger science even than that other youngster, flying. Things go so fast in this aviation business, sometimes too fast. They go fast in aeronautical radio, too, but it happens that there are some very sober young heads in this latter science, and they seem to be unnecessarily slow.

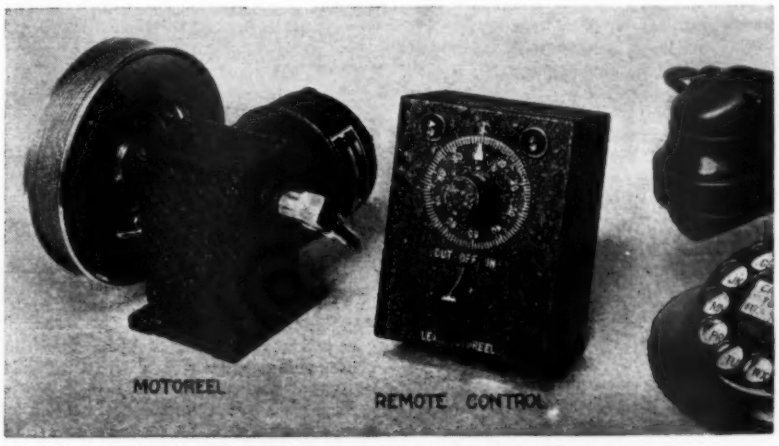
"They only seem to go slowly, however. Actually they have moved with amazing speed. Within 10 years, this country has been crisscrossed with invisible radio *highways* for the use of the airplane pilot. The first experiments with the radio range beacon at the Bureau of Standards revealed defects and handicaps that seemed insurmountable, but these slow radio engineers soon correct them. Developments in aeronautical radio have been so rapid that last month's improvements are often considered obsolete. You can find no fault with a science that operates on such a schedule as this.

"Nature put obstacles in the way of mechanical flight. These have been overcome. The obstacles she places in the way of aeronautical radio communication are much more intricate, and require far more research for solution . . . It is possible now to fly cross country safely without sight of the ground. It is possible to land safely without sight of the ground. When radio aids, in the short space of 10 years, have produced a substitute for human sight in a vehicle that moves 200 miles an hour, is that very much of a lag?

"We consider instrument landing (The Air-Track—Ed.), the newest real contribution to air transport. We believe it introduces a new epoch in flying. Meanwhile, we're moving. And meanwhile pilots are willingly trusting their lives and those of their passengers to radio.

Aviation in Print

Of late there's been an awful lot of aviation writing in the magazines, brought on, doubtless, by the run of hard luck and by the ever-mounting interest in flying. As a matter of fact I, myself, have been guilty



Radio has proved to be aviation's greatest safeguard.

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of sticking out my own precious neck in the pages of lay magazines.

And, as is ever to be expected, a storm of abuse was churned up by certain small minds who quiver at the prospect of looking eye-to-eye at life. Also, considerable hula-balloo arose from the throats of individuals who gain their way through life by resorting more to squawks than to effort.

You somehow feel a little sorry for the timid boys and girls. It is sad, for example, to dwell on that poor benighted soul out in California who wrote to *Liberty* complaining bitterly that my "trick" (his word) mustache is the cause of my warped personal viewpoint and my generally nasty disposition. How can a brain allegedly human become so emulsified, so broken-down into fatty globules by the heat of malice, as to loose even the power of kindergarten logic? My wispy old mustache the cause of anything! Such, friends, is what temper has done to the splendid young mental processes of Transport Pilot number thirty-five thousand, three hundred and forty-three!

Then there was a testy critique in *U. S. Air Services*, the Industry's little jingo journal, presented under the silly title of, "Two Articles, One of Which Is Worth Reading." (Evidently they had a shortage of upper-case o's and w's.) And, of course, I'm the one *not* worth reading—a point I subscribe to wholeheartedly.

However, I'm sorry that I can't commend this particular objurgation to your attention. It's a bit too tin-horn for intelligent fare, dull and typical Washington writing. Besides, it is the kind of thinking you always get when a professional patriot stands his flag in a corner and tries to mingle with his peers. Skip it and miss nothing.

On the other hand, those air line pilots who disagreed with me (not so many of them at that), were very sane and thoughtful in their approach. There wasn't the slightest inclination to vilify me or have me boiled in oil. Every last one of them —God love 'em for it—seemed to understand perfectly that the only thing I want to do in this world is bend a lusty oar for the cause of aviation. They said I was wrong many ways, and each expressed his point of view very intelligently to substantiate his thought. But not one charged my cock-eyed thinking to the fact that I push a typewriter around for a living—or to my beautiful whiskers.

It would be unfair not to tell you that David L. Behnke got hopping mad at me. Or, on second thought, maybe, Mr. Behnke, who is president of the Air Line Pilots Association and a sort of walking delegate for the American Federation of Labor, is merely grabbing onto what I said in the desperate hope of getting some fuel for his fast-dying A. F. of L., fires.

Trade Unionism, you may or may not know, has failed miserably in our Beloved Industry. It helped mighty mighty few, and those mostly on the payroll of some Local. Nor did it bring with it journeyman honesty and dignity such as is found in the Railroad Brotherhoods, Printing Trades and the Theatrical Unions to mention a few. Our dish has been more of

(*Concluded on page* 56)

United Designs New Gas Truck for Mainliner Fleet

The new gas tank truck designed by United Air Lines for servicing planes.

ANOTHER step towards more efficient servicing of its new fleet of Mainliner transports has been taken by United Air Lines engineers with the design of a new-type gas truck that is capable of servicing one of the new Douglas-built ships in six minutes. Eight of these trucks have been placed in operation at Newark, Cleveland, Chicago, Omaha, Cheyenne, Salt Lake, Oakland, and Seattle.

The tanks, including the 1900 gallon capacity gas containers and 200 gallon oil tank, were constructed for United by the Farrell Manufacturing Company. The servicing equipment on the entire fleet is identical and provides for gas pumping at 200 gallons per minute, a hundred gallons per minute from each of the two hose connections. They also pump oil at twelve gallons per minute.

The oil storage tank has a heating unit which keeps the oil warm while in storage and the hose reel compartment also has a heating unit which keeps oil warm at low temperatures. The pumps and compressed air unit are operated from the motor and the United gas truck fleet has complete searchlight and fire extinguishing equipment. Several small compartments to accommodate such spare equipment as radio parts, bulbs and flashlight batteries greatly enhance speedy servicing.

The trucks have been printed red and each has a service platform, full meter equipment and rear compartment for hose reels. The cab is enclosed and is heated.

Details of the Luscombe Phantom
by FRANCIS DIXON, Jr.

A SHORT time ago I had an opportunity to visit the factory of the Luscombe Airplane Development Corporation at Trenton, New Jersey, where I had an opportunity to see this wonderful plane under construction.

At the time I visited the factory, there were about a dozen planes in various stages of construction. Two of these were almost finished and within a few days would be in the air.

The process by which these planes are made is very interesting. Each plane is made in sections, beginning with the tail. Each section is fitted into the one before it and riveted to it, thus eliminating entirely the need of framework. The entire plane is made of metal, eliminating the need of wood and glue. The monococque fuselage is made with duraluminum.

This amazing plane has undergone the different tests with gratifying results. The duraluminum fuselage has undergone a static test, supporting a weight of 118,000 lbs. without sign of failure, and it only weighs 150 lbs.!

In a power dive of 300 m.p.h., this little plane maintained its rugged structure with no sign of weakening.

Such parts of the Luscombe Phantom as wing spars, master ribs, special bolts, metal fittings, etc., are all purchased to specification from larger factories. In this way the cost of the Luscombe Phantom is kept down to a minimum. The entire assembly, however, is all done at the Luscombe factory.

The specifications and performance of this little plane should catch the eye of any exacting customer.

SPECIFICATIONS AND PERFORMANCE

Specifications

Span, 31 ft.
Length, 21 ft.
Wing area, 143 sq. ft.
Power loading, 13.5 lbs. h.p.
Wing loading, 13.6 sq. ft.
Empty weight, 1300 lbs.
Useful load, 650 lbs.
Gross weight, 1950 lbs.
Fuel capacity, 35 gals.
Oil capacity, 3.75 gals.

Performance

Maximum speed exceeds 160 m.p.h.
Designed diving speed, 294 m.p.h.
Diving speed with flaps, 149 m.p.h.
Cruising speed, 140 m.p.h.
Landing speed, 45 m.p.h.
Service ceiling, 19 000 ft.
Rate of climb, 1200 ft. per min.
Cruising range, 560 miles.

The day that I visited the factory, Socony Vacuum's Luscombe was in for

(*Concluded on page* 61)

Did Murrell Invent the Airplane?

by CHARLES W. BROYLES

Here is a description of an interesting old patent that antedated the Wright patent, but which fell a victim to the same circumstances that floored many other pioneer inventions.

WHEN the history of aviation is finally written, neither Langley nor the Wright brothers will receive the credit for making the first successful flight in a heavier than air machine, but a slight East Tennessee mountain inventor and preacher.

Years before the Wright brothers were born, he was experimenting with working models and in 1887, when Wilbur Wright was only ten years old and Orville five, Rev. M. M. Murrell of Morristown, Tenn., secured U. S. Letters Patent No. 194,104 on the first heavier than air machine to carry man in successful flight.

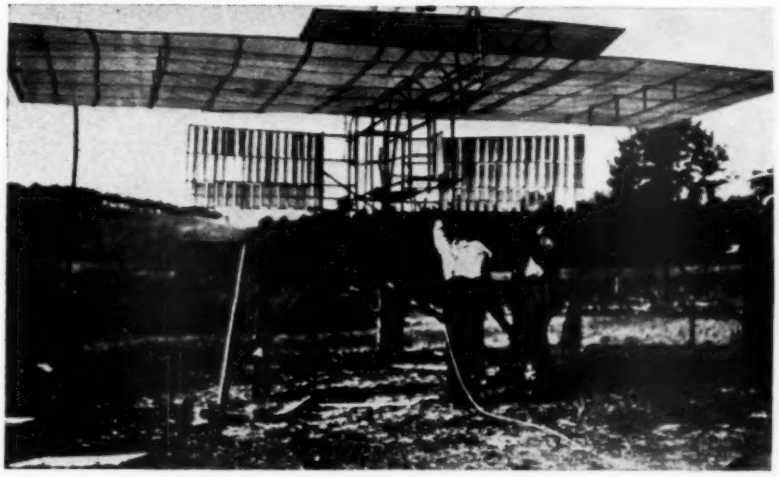
Rev. Murrell was born in 1855 at Panther Springs in Hamblen County, Tennessee, where his father, Marcus R. Murrell, a prominent business man of Morristown, had opened a general store and built a home at the historic stage coach stop on the old Knoxville to Bristol road. This home was known as "the White House," being the only painted dwelling in that entire section, and it was here the "well to do" father indulged his son's inventive fancies.

Young Murrell, through watching the birds, decided at an early age that man should fly. Neighbors still delight in relating how as a child he secured some large cabbage leaves from his mother's garden, climbed to the top of a stone wall and, like Darius Greene, jumped off gaily flapping a leaf in each hand. But the sudden landing failed to check his enthusiasm, and as he grew older he spent many fascinating hours before the fire whittling out models of flying machines.

When 22 years of age he secured the patent on the machine in which he made many flights in the presence of numerous witnesses. Taking off from a hill top in his father's orchard, and manipulating the contrivance with hands and feet, he would fly for several hundred yards before lack of motive power would force him to land.

It was this lack of motive power that caused young Murrell to refuse an offer of $60,000 for his patent. The offer was made by parties now unknown to the Murrell family, who got in touch with the young inventor through the patent office. Believing that he was working along the right lines, and that eventually he would develop his machine so that it would be capable of sustained flight, he persistently refused to dispose of his patent rights.

It will be noted from the accompanying illustrations that the young inventor had developed a number of features that are now incorporated in the modern planes. This is all the more remarkable when we reflect that although about this time Cagley, Stringfellow and Henson in England, and Penaud and Mouillard in France, were making experiments in aerial navigation, it is almost certain that young Murrell had never heard of their work. It is unfortunate that his model, which was of the ornithropter type, was not preserved. All that now remain are some photographs and the old patent which have been kept by members of the Murrell family.



Front view of the Murrell airplane or glider of 1877.

It will be observed that his machine had the same general frame work, wings and rudder, that are used in building the aeroplane of today. However, the wings, instead of being rigid, were hinged so that they moved up and down like those of a bird, and were operated by numerous cords, pulleys and cranks manipulated by the hands.

The wings were also divided into narrow cross sections, each of which was hinged at the ends by axes in the framework so that the sections opened edgewise on the upward stroke reducing air resistance to the minimum, and laid flat on the downward stroke, thus giving the opposite effect.

According to the patent, "The fans or slats of the wings are so arranged that when the wings are being raised they shall open, so as to present as little resistance as possible, while on the reverse motion they become closed, so as to render the greatest possible resistance to the atmosphere." "Operated by the hands and feet," the machine was "guided by the tail," which was capable of "a wriggling or partially rotary motion," and "the angle of the tail could be horizontally altered, or caused to assume a vertical position by means of an endless cord" which was "conducted over pairs of pulleys and around the pulley of the tail."

Even the straps for holding the operator in his seat were not forgotten, one set crossing over the back while others passed "around the arms and over the shoulders, leaving the arms and hands free to operate the different parts as described."

What heights in aviation young Murrell might have reached, both literally and figuratively, will never be known because his love for adventure in this field was soon overshadowed by a greater passion. Scion of a religious family his reverence was fanned into flame when he was converted in a revival meeting.

Although he never attended a theological seminary, and the old Morristown Academy represented his highest training, he was an insatiable reader, and soon became a thorough student of the Bible. Then for 45 years he rode horseback for thousands of miles up and down the trails of the Clinch and Cumberland Mountains, and throughout the East Tennessee and Sequatchie Valleys preaching.

And like his flying machine his sermons were not released until they were perfected. Guests at the Murrell home were sometimes startled in the early morning hours to hear some one preaching with great vigor and earnestness.

Investigation would reveal Rev. Murrell in the barnyard preaching to cows and chickens a sermon which he planned to deliver soon before a congregation. But the studied effect of his sermons did not detract from their zeal, as they were frequently delivered with such challenging force that hardened criminals were brought to their knees.

If called to preach the funeral of some drunken royster, killed in a brawl, he was more likely to take as his text the stinging "In hell he lifted up his eyes," than the comforting "in my Father's house are many mansions," and the resultant sermon often swayed audiences.

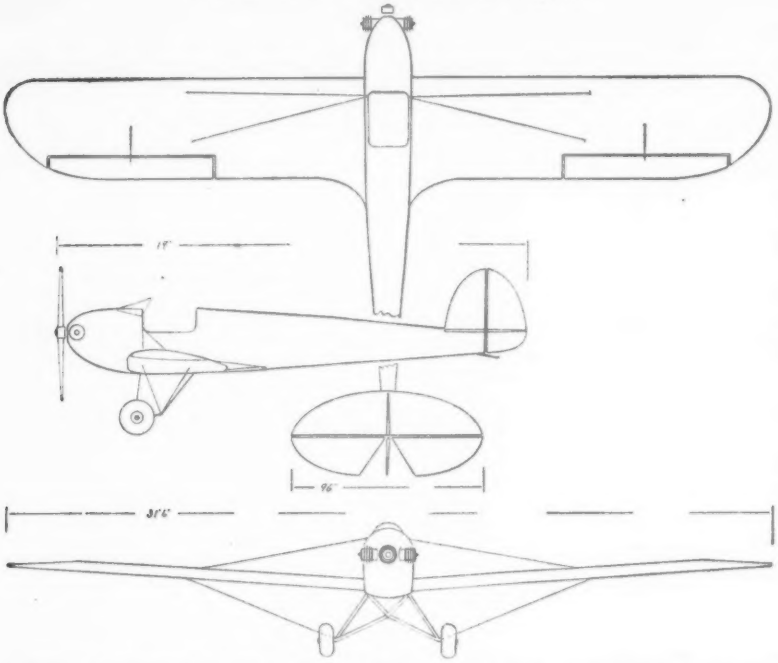
He continued preaching until a few months before his death in February, 1932, and was a firm believer in the airplane until the last.

END

Some Practical Notes on the

A three-quarter front view of the Low-Wing Longster.

Rear elevation of the Low-Wing Longster.



Orthographic scale drawings of the Low-Wing Longster shown in the photographic views above. This plane is the outcome of a long series of experiments by Mr. Long.

by

LESLIE LONG

Noted for his lightplane designs and research work in amateur aviation.

NO DOUBT many of you will remember that a year ago last fall POPULAR AVIATION carried a feature story covering a series of lightplane experiments I had made.

As you may recall, the story related how during the summer of 1935 I built and tested four distinct types of light ships. They consisted of the "Hi-Low," a radical design with bent wings, a strut-braced low-wing, a wire-braced low-wing and an orthodox parasol. All were approximately the same size and weight and all were powered with the same Harlequin motor.

The purpose of the experiments was to find out whether the low-wing type was as safe and efficient as the parasol and if so, which type of low-wing was best suited to amateur use. On the whole, the results were distinctly in favor of the low-wing. It proved to be faster, had lower landing speed and quicker take off and had better visibility for the pilot.

In rate of climb only was it slightly inferior to the parasol and the reason for that was known, for to be fully efficient a low-wing must have proper "fillets". The stability and handling qualities were good and on top of all its appearance had a certain "something" a parasol never has.

As to type, the wire-braced design was far and away the best. It was proved beyond doubt that overhead struts are fatal to performance in a light ship. The air flow over the top of the wing is broken up and the result is bad. Climb was poor and the ships had a loggy behavior that was anything but satisfactory. So far as the light low-wing is concerned there seem to be but two practical designs, the cantilever and the wire-braced type. As the cantilever is rather ambitious for the average amateur that just about eliminates everything but wire bracing.

Following the publication of the article, letters were received from practically every civilized country in the world. These letters only confirmed what had already been concluded, which was that amateur builders and flyers are greatly interested in the low wing type of ship. This is only natural, considering that nearly all racing, military and commercial planes are low wings.

With that fact in mind, it seemed that the best way to encourage amateur interest would be to design a ship along such lines, making use of the data gathered during the series of experiments. Actual construction was started last fall, but press

Construction of Low-Wings

of other work prevented its being finished at that time. Now it is spring, and while the ship is being tested it is not fully completed.

As it was designed solely for amateurs three points were always kept in mind. They were safety, ease of construction and low cost. There is nothing particularly radical about it.

The most noticeable features are the landing gear and the wing roots. As the drawings and photos will show, the number of parts has been reduced to the minimum. The landing gear serves as the complete wing lift structure. The dash is a combination of instrument board, pilot protector and landing wire attachment.

There are no pylons, cabanes or other members sticking out in the wind. The landing gear is entirely separate from the wings proper, which is unusual in a low-wing and means much to amateurs, as the wings may be detached in a moment and the fuselage towed anywhere on its own gear.

The control stick has no horns, pulleys, bell-cranks or other gadgets. The aileron and elevator cables hook directly to it, and there isn't a pulley in the entire fuselage. Only four are used in the entire ship, those near the ailerons.

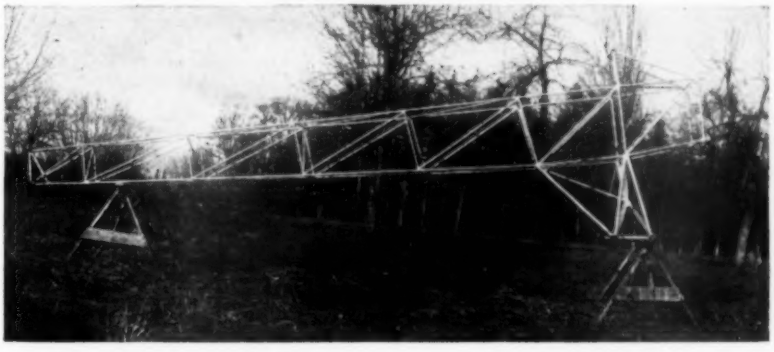
Actual cost of material is about $100, exclusive of power plant, but this will vary with the cost of airwheels. There isn't a single tricky thing about the construction. Fuselage is standard welded steel tubing, fabric covered. Tail feathers the same. The wings are the usual two-spar type, with truss ribs and fabric covering. The roots are modified so as to form the fillets, but that only requires extending the butt rib back about 20 inches and shaping to conform with the bottom of the fuselage. In other words, the fillets are built into the wings, rather than being put on after assembly. That simplifies things a lot.

While it can scarcely be noticed, the wings have drag and anti-drag bracing. The drag-wires show only about a foot of length, and the anti-drag wires are completely concealed in the fillets. Drag-wires mean a lot when the going gets rough. The ailerons are the Friese type and highly effective.

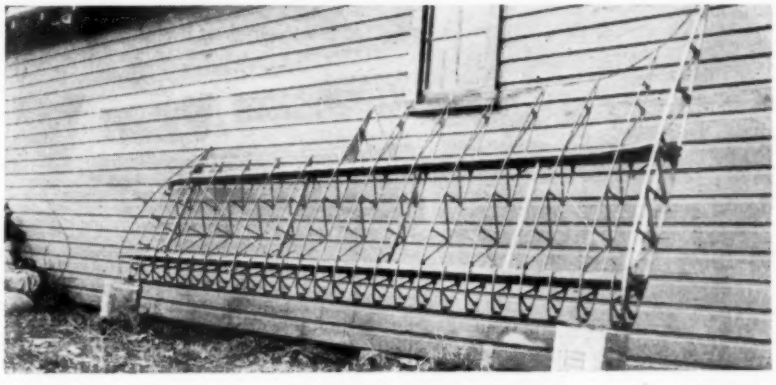
The lift-truss consists of 2 cables for each wing and they run from the spars to a fitting directly behind the tire of each wheel. The cables are much shorter than on an equivalent parasol, in this case only 8 feet long for a ship of nearly 32 foot span. Fuel tank of five-gallon size is carried under the cowling. The ship was designed for the Harlequin motor, but at the last moment there was none available and an L-head Aeronca was used instead.

It is too bad that the photos had to be taken before the ship was properly finished, but they were the best to be had if this issue of P-A was to be caught. The temporary cowling is anything but what it should be. The weather has been very

Side elevation of the Low-Wing Longster showing the fuselage fairing methods and the landing-gear streamlining.



The simple yet sturdy fuselage structure of the Low-Wing Longster.



The uncovered wing structure of the Low-Wing Longster, showing the builtup ribs, the edging and spars.

bad for weeks and the final assembly and flight testing has been done in an ice cold rain.

Flight pictures have been out of the question, but the ship has a very good appearance in the air and on the ground. When finally completed it will have a windshield, head-rest, crash-pads and other decorations. It is hoped the Editor will give us space in the future for a better photo and a flight shot to go with it. (Swell—Editor).

The color scheme is canary yellow fuselage, snow white enamel wings and black nose and trimmings. Nine coats of clear and pigmented dope were used, each coat being sanded. As will be noted, the landing gear is fabric covered and finished in black. Later on spats will be fitted over the wheels. Before next winter, the turtle back will be raised and a sliding cover and proper wind shield fitted, which will convert it into a fully enclosed cabin job.

It is too bad that fuller reports on flight

characteristics can not be given at this time. The weather has been so bad that nothing more than short hops has been attempted.

Thus far, the ship meets every expectation and in many respects is better than hoped for. It gets off the ground in a very short distance and is entirely stable in the rough air. The high speed is not less than 90 and it cruises at 75 on two-thirds throttle. The landing speed is just 30 miles per hour. The rate of climb is approximately 800 feet per minute, which fact was quite a relief to all of us.

The weakest part of low-wing planes is their slow climb and the fact that this does so well is proof that the weakness is not incurable. As is now well known, the tendency of low-wings to be poor climbers is due to the burble effect that takes place at the junction of wings and fuselage. With proper fillets this burbling does not happen and the ship will equal any other type in climbing ability.

During the past ten years, I have designed and built nine different types of lightplanes and to all appearances thus far this one is the best of the lot. To the serious minded amateur who wants something to build up hours in and to fly around in for the sheer fun of it, it is recommended. I think I can truthfully say that it would be very hard to find anything simpler, safer and cheaper to build than this. It is adapted to several power plants, such as both types of Aeroncas, Continental A-40, British ABC or British "Cherub", the Harlequin or Salmson AD9.

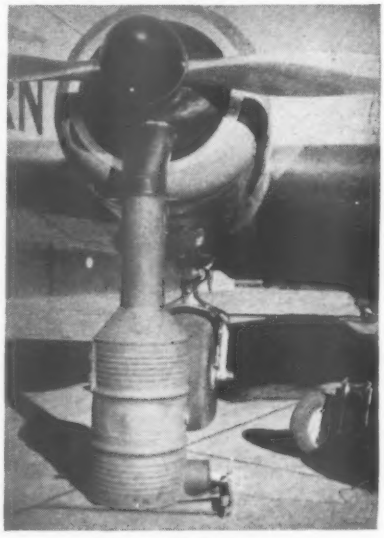
Amateur building interest is not as high as it once was, due of course to the unjust Federal and State aviation laws, but it is hoped that the simplicity and low cost of this little job will get the old crowd back in line again.

And speaking of unjust laws, the Editor has promised me space in an early issue for a history of our Oregon aviation laws during the past 17 years. There will also be given a detailed account of our present

(*Concluded on page* 59)

Showing the landing-gear members and connections.

A Homemade Heater



The assembled heater.

IN anticipation of difficulties that may be experienced during extremely cold weather this winter, Chicago and Southern Air Lines have designed a heater for warming engines. Tests have shown that it can be done quickly, safely and economically.

During initial tests with temperatures as low as 15°, they were able to warm an engine in less than 20 minutes so that it was practically ready for flight. The oil inlet temperature of the engine itself was up to 100°, the oil tank had been brought to 74°, and the head temperature 200°.

The heater shown here was made from a 30 gallon oil drum by installing a small grate about 12 inches from the bottom, and then by placing a pipe underneath the grate a small 6-volt electric auto fan was installed. This can be quickly connected to the battery and supplies a forced draft. The upper pipe extending from the stove has three wire screens to prevent the possibility of any sparks or flames reaching the engine.

You will notice that the heater is attached to the engine directly on the nose cowling in behind the propeller and is held in place by a flange which extends on into the nose cowling. It is made in two sections and held together with ordinary hood clamps. A deflector is placed in the lower section so as to force the heat down to the bottom cylinders, allowing it to rise around the entire engine. A heavy insulated canvas covered blanket is thrown around the cowling for additional insulating.

Charcoal with a little paper is used to kindle the fire and then a shovel or so of coke is placed on top. This can soon be fanned into a solid bed of coals without gas, flames or sparks rising, and provides a steady heat. After the fire has been kindled, it is found that less than 4 volts is necessary on the small fan to give sufficient heat to warm the engine in a very few minutes.

Lovingly Dedicated to James L. (Fiddle-Feet) Hurst

by the Arrow Staff

Poem by.....C. R. McDonald, Inspector
Typewritten by.....Gertie, Office Queen
Postage paid by.....Pete Engel, Production

HURST left the hangar at a quarter past eight,
And roared through the heavens in his Arrow V-8.

He headed towards the sun which was then in the east,
Doing better than a hundred, to say the least.

When he reached Des Moines it began to thunder
And he pulled up steep to let the court house go under.

The wind it blew, and the lightning flashed,
While against the wings the hailstones crashed.

There were clouds above and clouds below,
Now, where in the hell did the landscape go?

Oh, the rain came down and Hurst went up.
It wasn't any ride for a buttercup.

But he kept on flying, hour on hour,
When he thought he sighted the Washington Tower.

As he flew around it, wildly careening,
He gasped with amazement, for the damn thing was leaning!

That was sure some wind, he said with a frown.
Our Nation's monument nearly blew down.

In a nearby field he felt ground once more.
Our hero had never been in Washington before.

A man came up with a face like a dish
To Hurst's inquiry, said, "No spik much Eng-lish."

"Oh, that tower there? It's like thee-sa,
That's the leaning tower of Pisa!"

Now he wasn't in Washington nor Cuba, by chance,
He wasn't in Spain, and he wasn't in France.

But in the land of spaghetti and Duce'es
Where they wear black shirts and ferment grape juices.

Some blamed it on the wind for the state of affairs,
For his wrinkled brow and his gray-tinged hairs.

But I know the "how-so," so I'll put you straight,
There's too much PEP in an ARROW V-8!!

Forecasting Flying Weather

by C. EUGENE BUELL
Associate Professor in Meteorology, Parks Air College

There have been a multitude of improvements in mechanical flying equipment—but weather is still the weather. Our author, an authority on meteorology tells, in simple fashion, the efforts put forth to solve the weather problem.

OF all the fields of human knowledge, there is no other that is subject to more misunderstanding and misconceptions than the science of meteorology and yet no other that is so closely related to human affairs, especially the art of flying.

To the general public, the weather is usually only a matter of physical wellbeing and comfort. It reaches some importance when rain or snow forces the abandonment of plans or when cold freezes radiators, but, otherwise, it plays an unrecognized and relatively minor role.

There are fields of human activity that depend on particular aspects of the weather —freezing, rainfall and so on—for the protection of crops and perishable goods, the estimation of river stage and runoff for the availability of hydroelectric power; but none other is influenced by so many possible aspects of the weather as aviation.

It should then be the aim of every one who flies or is learning to fly to acquaint himself with the fundamental principles of meteorology. This applies especially to the free lance pilot on whom the whole responsibility lies as to whether a flight is to be made or whether he will remain on the ground.

For the application of the principles of meteorology to the problems of flight, one must know what weather information is available and where it can be obtained. There are two sources of information that may be used by any one. They are (1) the radio broadcasts of weather that are made from the radio range stations each hour and (2) the weather information that is sent over the Department of Commerce teletype and radio circuits.

The material obtainable from the first of these sources is rather limited since the range stations broadcast the weather observations only for the stations in their neighborhood. In the second place, one must have a receiver that is capable of receiving the frequencies on which these broadcasts are made (roughly from 400 to 200 kilocycles).

Aircraft radios are built for this purpose, but there are very few commercial radios with this band. Thirdly, there is no way in which the past broadcasts can be kept for reference, unless one listens to them and makes a record thereof, which is quite a task.

Dr. Buell, of Parks Air College, with Nat Tooker, ready to release the hydrogen pilot balloon for taking a reading. The theodolite used for the measurements is in the foreground.

The second source of weather information is by far the most satisfactory. The information may be had at any of the airports that are on the Department of Commerce teletype or radio circuits. The weather is printed in a system of symbols by the teletype and forms a permanent record.

It is necessary that a system of symbols be used in order that the vast amount of material available may be collected in the limited time allowed. About half of each hour is allotted to the collection of weather information from a fixed group of stations along the airway.

The remainder of the time is used for the many other forms of information that it is necessary to send to complete the weather picture. We will refer to these other reports later. The importance of the hourly observations certainly justifies the time on the circuit that they take. It also should justify a complete understanding of them on the part of the pilots who do or should use them.

Every pilot should be able to "decode" these hourly observations with ease. The system of symbols used is not complex or difficult to learn. However, it is not the purpose of this article to explain it.

The explanation of these symbols is to be found in the "Instruction for Airway Meteorological Service," Circular N, Weather Bureau, and may be obtained from the Superintendent of Documents, Washington, D. C., for the price of twenty-five cents. It is a good "two-bits" worth and should be studied by every one who flies.

The method of decoding these hourly observations is important, but it is not enough. To appreciate them fully, one should be familiar with the way in which they are made. It is included as a part of the Meteorology Course at Parks Air College that each student make a certain number of practice observations in order that he be completely familiar with them.

Some students who show sufficient aptitude are allowed to become cooperative airways observers and assist in the activities

Students in the meteorological laboratory making up final weather map.

A student transmitting weather reports by means of the teletype.

of the Airways Weather Observation Station maintained at the College. A description of the way in which these observations are made is also included in "Circular N."

Between the hourly "sequences," as the hourly transmission of weather observations is called, there is sent much supplementary weather data. Most important to the aviator are the winds aloft. These are transmitted four times a day and give the surface wind direction and velocity, followed by the direction and velocity of the wind every two thousand feet from the surface up to occasionally about twenty thousand feet above sea level. These are made by means of a pilot balloon.

The pilot balloon is a large balloon made of high quality rubber. It is inflated until its rate of ascent will be 180 meters per minute. After the balloon is released, it is watched through a theodolite, an instrument similar to a surveyor's transit. Each minute, the angles of the theodolite are recorded until the balloon goes out of sight.

The velocity and direction of the wind is computed from these readings. This, together with the fact that the rate of ascent of the balloon is nearly uniform enables the observer to determine the direction and velocity of the wind at any altitude covered by the ascent. The direction and velocity is transmitted on the teletype for each even thousand feet above sea level.

Four times a day the Weather Bureau issues forecasts for the use of airmen. These are not like the forecasts that appear in the daily papers, but are specifically made to meet the needs of those who fly. There are two types of forecast sent: the district forecasts that cover the conditions over an extensive area and the terminal forecasts that cover the conditions at the specific air terminal for which they are made.

These forecasts are made for an eight hour period (overlap of two hours) with the consequent improvement in their accuracy. These forecasts are sent in an abbreviated form of "plain language." In order to save time in their transmission the longer words are shortened by leaving out some of the letters. Thus, VISIBILITY is sent as VSBY and THUNDERSTORM as THDRSTM. With a little practice any one can read them with ease.

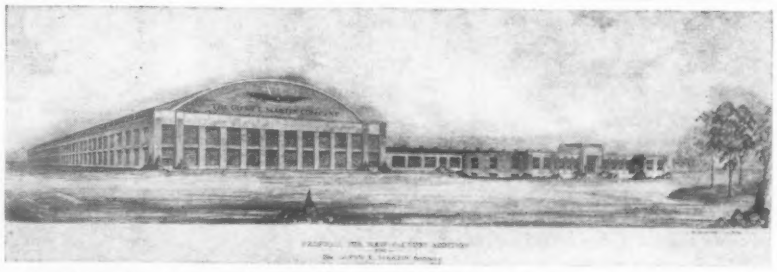
This by no means exhausts the data that is sent over the teletype circuits. There are the "Map Reports" that are sent four times a day and from which the forecaster and local weather men at the terminals prepare their weather maps. These are sent in a special word code since most of the reports must be handled through commercial telegraph facilities. They require a little skill to translate quickly.

Aerological observations are made each morning at a number of places throughout the United States in order to obtain a more complete picture of the upper air conditions. These are made by sending up an airplane carrying an aerometeorograph, an instrument that records automatically the temperature, pressure and humidity throughout the flight.

The results of these flights are sent over

(*Concluded on page 60*)

Two-Million Dollar Plant Expansion for Glenn L. Martin Co.



Architect's drawing of the new Glenn L. Martin plant to be erected in Baltimore.

AN expansion program which will give the Glenn L. Martin Company's plant at Baltimore, Md., the largest assembly floor in the world for the manufacture of aircraft was announced recently.

Construction on additions to the present factory and the purchase of new equipment will cost approximately $2,000,000. In this expenditure will be $600,000 for the latest machinery for the advancement of efficiency in the production of aircraft. The improvements will double the capacity for the plant.

As part of the factory addition, there will be constructed an assembly hall 300 feet wide by 500 feet long, with a net headroom clearance of 40 feet, which will constitute the largest unobstructed airplane factory space in the world, having the greatest unobstructed span of girders of any aircraft factory in the world, according to Mr. Martin.

The building of the large assembly hall enables the Glenn Martin company to undertake the building of giant aircraft twice the size of the famous "China," "Hawaiian" and "Philippine" Clippers designed and built by that company.

Contracts between the Kingdom of Siam and the Glenn L. Martin Company have been closed for $625,000 worth of airplanes. The Siamese representatives and officials of the Martin Company are in this group.

Airplane Sanitation of Importance

THE modern agency of international airlines is looked upon as one of the greatest boons of the age, but 23 nations recently signed a sanitary convention at The Hague which is designed to thwart possible spread of disease.

Fearful that plagues such as devastated Europe in the Middle Ages might unwittingly be transmitted over wide areas by airplane passengers, the convention signatories order that:

1—There must be a sanitary organization at every airport where international planes land.

2—Special "quarantine" airports must be established for sanitary inspection of passengers and planes. They will be equipped so that if necessary they can isolate passengers and disinfect planes.

3—Existence of infectious diseases at any airport must be immediately reported.

4—In countries where yellow fever is a menace airports will hereafter have to be a safe distance from all civic centers.

5—All airport doctors are given authority to inspect passengers and planes, forbidding transport of passengers suspected of infectious diseases.

The Permanent Wave "Aerienne"

by FLOYD LOGAN

The author, a former M.G.M. cameraman, gives a highly entertaining account of the first attempt at high altitude hairdressing. If you've a sense of humor, you'll enjoy this.

"SWEET shades of Lavender, what's that?" exclaimed a breathless pilot at the Ford airport, as he ran down the walk leading to the operations office, where there stood a huge Ford tri-motor ship.

There was a crowd around that ship, all right, for things unusual to the staid old airport routine were going on. But let's look.

Heading for the ship, in the order of their appearance, we behold two very beautiful and charming young ladies in abbreviated decollete (we'll say). Directly following them were three men carrying a permanent-wave machine — a sparkling thing resembling a miniature weeping willow tree.

Instead of branches, however, there were wires; in place of leaves, were little electric coils. This thing sprouted out all over the place.

Following this procession came a pilot, perspiring, in uniform. Following him was a gang of fellows from some storage battery company, all lugging batteries, while in the rear were more curious onlookers. The whole set-up did look rather unreal.

Still, I wonder; beauty shops seem to sprout up most anywhere and here was one that was about to sprout up as high as it could go—and the ceiling that day, gentlemen, was about ten thousand feet. So, motors idling, standing here was the world's first flying beauty shop. A newsreel stunt, I'll admit.

One of the young ladies was about to receive a permanent wave in two countries at one and the same time, United States and Canada. Yes, we were to fly back and forth across the Detroit river, circle around Windsor, Canada, and then hop back over Detroit while the beauty specialist did her international operating on the charming girl friend for my clicking camera.

The storage batteries were for the purpose of heating the wave machine and it seemed that the ship was weighted down with them—batteries occupying all the conceivable space in the cabin—even to the pilot's compartment.

The decollete dress of the girls was another thing—they didn't wear much. Perhaps for the reason that the weather was warm and balmy or, perhaps, that's the way they dress around beauty shops, their raiment was exceedingly scant. I was expecting them to blow to pieces before they even got aboard but they managed to stay together someway, kept their shirts on, I mean. This flying camera job is so complicated at times. Ahem!

The sponsors of all this excitement happened to be a wholesale beauty parlor equipment company—Gibbs & Co., Detroit. They had chartered the ship, furnished the girls and equipment merely for the publicity that they would derive from it. For the equipment bore their name, which in turn would be flashed on the screens of countless theaters. It was an odd subject and a dandy newsreel topic. So I was right on the spot with the old flying camera, covering it for my company, International Newsreel.

Perhaps, in the course of time, the "Mainliners" of future scheduled runs will contain fully equipped tonsorial departments—who knows?

Will we ever see pendant hair-curlers over these seats? Your guess is as good as ours.

The seats in the ship had been removed and now a barber chair, an electric lamp for drying hair and the permanent wave irons were made fast to the floor of the plane, the girls superintending the job. Juice from the batteries to this equipment was hooked up while I lashed the camera down forward, covering our cozy beauty parlor scene. I also carried an automatic Eyemo hand-camera to shoot aerial scenes of the terrain below. On the screen the continuity would run something like this:

An air view of the field as we took off from the airport. Then flash to girl sitting down in chair and operator starting to attach curlers. Then both girls look out window and again I flash an air view of the big Ford plant in River Rouge. Then back to girls, then another aerial flash of Ambassador Bridge (then under construction). Then back to girls; again they peer out the window and another aerial view of Windsor, Canada, below; then girls again and a flash over the Detroit downtown section. Sort of an air travelogue of what the girls see from the Flying Beauty Shop. Then up the Detroit River over Belle Isle, then Gar Wood's home, circle over Lake St. Clair looking at a sailboat race, the Yacht Club, Boat Club, then over Canada, here and there and finally back to Dearborn —our home airport where we would sit-down again and where our leading lady, permanently waved as it were, would exit the crate laughingly, waving Adios to the beauty expert and pilot. And she would bear the distinction of wearing the first aerial wave in flying history.

We were ready, the motors warmed. Down the field we taxied, then turned abruptly into the wind. The pilot gunned the motors; we lifted our tail and were off. Circling the field we quickly gained altitude and in a few moments I was peering down into the stacks on the Ford plant. Then we veered east along the river, picking up downtown Detroit.

I had been busy with both cameras since the takeoff and we completed our trip as planned. I was getting along nicely with my sightseeing shots but that permanent wave outfit wasn't doing so good. It was lukewarm but not hot enough. So we completed our sightseeing journey and I finished the aerial continuity. Still the irons were not hot, so we stalled around waiting for them. I went up and sat in the co-pilot's seat and talked with the pilot.

As I sat there, looking out of the win-

XUM

dow, the uncompleted Ambassador Bridge, which links United States to Canada, hove into view. I had made two or three subjects of this, in various stages of construction, and now it was almost completed.

I could see workmen on the bridge catwalks working on the cables, three hundred and twenty five feet up towering over the river. A swell engineering job — that bridge. So I asked the pilot to fly low and follow the bridge cable right across, which I would follow up with ground shots later. I glanced at my footage meter to see that I had enough film as the pilot maneuvered the big ship into position.

Then we hopped across the river in one beeline, the camera gunned right on the cable. Over on the Canadian side we made a bank and I shot some swell head on approaches to the bridge, with a big freight boat steaming serenely along underneath the bridge. Then we climbed to higher and safer altitudes.

And we stalled around, doing this and doing that until I felt the urge to go back to the beauty department which was our real job.

Still, the irons were not hot back in the beauty department. The crate had been chartered for only one hour and our time was up. I simply must have a shot of that girl with a swell permanent wave—or no film version for the reel. All the scenic film meant nothing without the crowning achievement of a wave.

So I asked the pilot to return to the airport as I had an idea that I could expedite matters. Back to the field we went and landed close to the air depot. Our girl was all hooked up to the machine—or vice versa —and had been for an hour. So I asked the operator if 110 volt current was not ordinarily used to run the wave machine and she said it was.

I promptly went to a hangar and borrowed a long extension cable and tapped the juice from the electric light circuit in the depot waiting room out to the machine in the plane. Things began to sizzle and the irons got plenty hot. In a short time, the operator began to disconnect the curlers from the girl's hair and I ground out a few feet of film on that, the all important permanent wave close-up.

Then, setting the camera up outside to cover the door of the ship and about twenty feet foreground, we were ready for the final scene. With camera turning over, the door opens and we behold two very beautiful and charming young ladies emerging in abbreviated decollete (one with hair meticulously curled and waved).

Behind me a pilot exclaimed, "Sweet shades of Lavender, what's that?" Directly following were three men carrying a permanent wave machine, a sparkling thing resembling a miniature weeping willow tree. Following this procession came our pilot, perspiring, in uniform. Then a gang of fellows all lugging storage batteries. The job was done.

I folded up and joined the parade which was fast disappearing into a crowd of curious onlookers. We were off the Flying Beauty Shop. I really mean OFF! For life. Sweet shades of Lavender. YES!

END

An Ancient Taube Found in China

From a letter by CARREL B. MORGAN

Here's the nose of the old Taube, probably an Albatros, showing the characteristic mounting of the 4-cylinder Mercedes engine. Lieut. Pflutsow is in the foreground.

I AM enclosing four pictures taken by my mother in 1914 at Haichow, North Kiangsu, China. Probably some of the POPULAR AVIATON readers would be interested in the pictures and the story of how the ship shown got to Haichow.

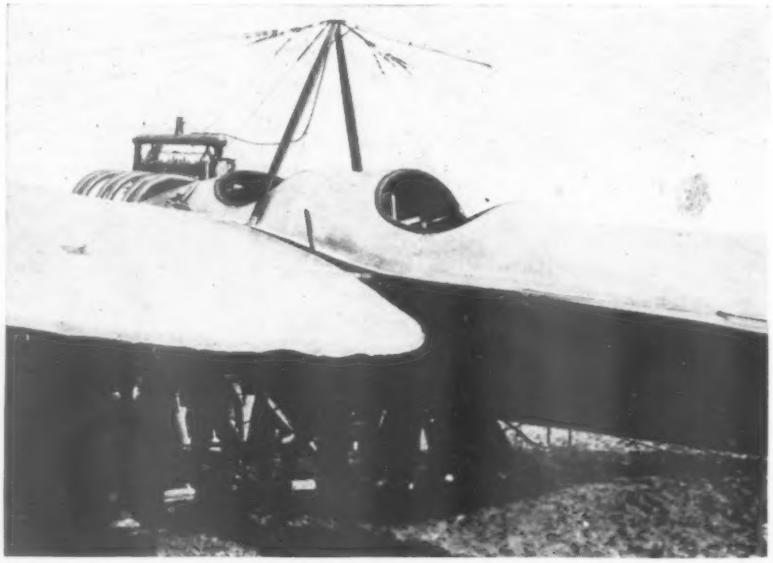
The ship is one of the early Taubes, built by the Germans and sent to China just before the war of 1914-18. The German government had secured a mandate over a small section of the coast on the Shantung peninsula called Tsingtau at the end of the eighteen-nineties.

They fortified this section of coast and used it as their base in the Orient. Soon after the start of the war Japan sent most of her army and navy over to Tsingtau to take the port from the Germans.

They put up a good fight against the Japanese, but their forces were far too small to stand up against the concentrated attacks of Japan, and they soon surrendered.

Just before the fatal hour, they sent Lt. Pflutsow off in one of their Taubes with some papers which they didn't want the Japanese to get. I'm not sure where Lt.

(*Concluded on page 66*)



Here we see the wire braced wings of the Taube and the towering cabane struts that marked this ship.

The NATIONAL AIR BOARD Says—

Unbiased Opinion to Further National Aeronautics

MEMBERS OF THE BOARD

Richard Aldworth
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Grover Whalen
E. Burke Wilford
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ALEXANDER KLEMIN, CHAIRMAN

THE eleventh meeting of the Air Board proved to be one of the most interesting and controversial gatherings in its short history. The success of the meeting was in no slight measure due to the presence of a number of distinguished guests.

These included Mr. George Armsby, Chairman of the Board of the Curtiss Wright Corporation, whose vast banking experience has been of inestimable aid to the industry; Colonel Harold E. Hartney, Technical Adviser to Senator Copeland's Committee on Safety in Air whose latest report offers so many valuable suggestions for American aviation; Dean Thorndike Saville, of the College of Engineering at New York University, one of the most distinguished sanitary engineers in the country who does all his traveling by air; M. Jean Brun of Air France who brought French experience in air transport to the disposal of the Board; Mr. George B. Post of Edo Aircraft, who is doing so much to build seaplane ramps and popularize water flying; and Major A. H. Stackpole of the Stackpole Press, a well known private owner who flew his own ship to New York to attend the Air Board. With these guests bringing a novel and valuable viewpoint to the discussions, much was accomplished.

A PRIZE FOR AVIATION SAFETY

As our readers know, the Board has for some time had under consideration the question of a trophy or prize for distinguished service in aviation. Many different suggestions have come in from readers of POPULAR AVIATION as well as from members of the Board itself. In fact there were so many suggestions, that it was embarrassing to make a choice.

Finally the question was referred to a sub-committee consisting of Mr. Post, Mr. Wilford, Mr. Brooks and Mr. Dean Smith. The Committee, unlike other committees that we have known, reported back promptly and decisively, and their recommendations were as equally promptly approved by the Air Board as a whole.

The Prize will be awarded for the greatest contribution to aviation safety made in any one year, either by a group, an organization or an individual. The award may be made for a new device contributing to safety—such as a new parachute for example; or a new technique in aircraft operation; or an exceptional record in safety made by an operating company or by a pilot; or for any other significant and valuable contribution.

It seemed best not to limit the scope of achievement in any way while defining the objectives of the prize. The first prize will be awarded for the current year, January 1st, 1937, to December 31st, 1937. Readers of POPULAR AVIATION and the public in general will be requested to send in suggestions to the Board shortly before the end of the year, and all suggestions will be carefully examined and duly voted upon.

While the exact details still remain to be settled, the conditions of the award are now fairly well defined and the undertaking is certain to meet with general support.

SUGGESTIONS FROM A FRENCH EXPERT

No one in Europe is better qualified to speak on the topic of transport operations than M. Brun, who was so welcome a guest. Speaking partly in excellent English, partly in French which was immediately translated for the benefit of American listeners, M. Brun gave some valuable suggestions.

To our disgrace it should be said that European transport has for the last year or two been singularly free from accidents. M. Brun attributed this desirable condition to equipment and general organization—as he had a right to do—but specifically he emphasized the following points:

1. The use of the radio direction finder in lieu of the radio beacon. As our readers know many American authorities are of precisely the same opinion, which should be given considerable weight.

2. The use of short-wave radio whereby all companies and pilots are in constant inter-communication, and keep each other constantly informed of varying weather conditions and other pertinent circumstances.

While our pilots are in touch with headquarters and with the weather services, they are *not* at present in touch with the pilots of other airlines. Certainly safety in flying is too vital a matter for any hindrance to be imposed by rivalry or competition. The sooner there is complete cooperation among all concerned the better for American flying.

3. Rigid rules and inflexible observance of rules regarding flying at predetermined altitude, well above the clouds with complete reliance on instrument and radio aids. Here, we have in theory exactly the same regulations, and our men are certainly as well trained as European pilots in blind flying. But as M. Brun pointed out it is psychologically tiring to fly completely blind, and in rough or ice forming weather the pilot is inevitably drawn to thought of what he should do on landing.

There is a great temptation to seek lower altitudes and the reassuring sight of land and familiar marks on the route. Whether the rules are always observed or not is open to debate. Certainly the newly introduced barographic and route recorder will be of great help in this regard.

4. M. Brun also pointed out that in French and English practice only one pilot is carried, but the second man is a specialist radio operator. The advantage of having a man whose job is to concentrate on the radio and weather end is indubitable.

For the longer distances of American travel the co-pilot is absolutely essential. The answer probably is that the co-pilot will have to double both as a flier and as a radio expert.

In ending his interesting talk, M. Brun voiced the hope that American authorities and services would cooperate in a friendly and wholehearted spirit with the French efforts to establish trans-atlantic air travel, and in thanking M. Brun, the Board assured him that as far as it could help, that would indeed be the case.

SOME SUGGESTIONS FOR SAFETY DEVICES

In the general discussion of the safety prize, Captain Depew thought that perhaps we already had all the safety devices, technique and knowledge necessary. Dean Smith of American Airlines supported this opinion. "Theoretically we already have the answer to every difficulty or danger and a remedy for every special circumstance. Perhaps it was a better coordination of such aids and knowledge that is needed."

Other members of the Board thought that there were still many devices to be developed, some of which for all we know are being developed at this very time. Thus, Mr. Augustus Post suggested that the award might well go for a parachute device for the entire personnel, or a device for a parachute which would carry a detachable cabin to safety.

Mr. Wilford thought that more attention should be paid to the basic structural

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strength of the fuselage. In a Pullman car strong I beams serve as a safe guard in the infrequent railway accidents that occur. Also the railroads have the Westinghouse air brake whose counterpart is still not available in flying. Mr. Wilford pointed out that while the strength of the wings was no doubt adequate, the fuselage was relatively fragile. Certainly a fuselage capable of absorbing a high rate of vertical descent and of standing up in the worst crash and landing speeds, which in emergency could be really low, would be a wonderful combination of safety factors.

AVIATION AT THE WORLD'S FAIR

Mr. Grover Whalen, President of the New York World's Fair and member of the Board, has honored it by requesting suggestions as to what can be done on aviation at this great exposition. "The first thing," said Mr. Armsby, one of the guests, "was to stop the arguments about North Beach Airport and see to it that a real airport is developed at North Beach." The views of our distinguished guest only reinforce views already stated in reports of previous meetings.

In the meantime, a representative of the World's Fair has been invited to attend the next meeting of the Board at which time the question of what should be done in aviation at the Fair will be exhaustively discussed. Certainly aviation at the World's Fair should not be a mere trade exposition but should have a vital educational significance.

HOW MUCH FREEDOM OF JUDGMENT HAS THE PILOT?

It is very often stated in reports of accidents that the cause of the accident was pilot's error. Captain Depew and Dean Smith disposed thoroughly of the notion that the pilot is always to blame.

The pilot might be to blame if only one or two factors entered into the situation leading to an accident. Generally he has a great number of factors to take into consideration, which are often confusing and contradictory. To be right always would require super-ability. The proper thing is not to require super-human skill of the pilot, but to make the margin of safety greater.

As a matter of fact, if the public only knew it, on many trips they were only flown to safety by wonderful pilot skill which is never reported. It is only failure under difficult conditions which brings notice in the press.

The Board also discussed the question of whether pilots were ever forced to go through a trip against their judgment. They definitely are not so forced. The pilot may receive orders to land or not to land on a field; the pilot may have fear of adverse criticism and take too great a hazard at times, but in the last analysis his judgment prevails. Of course he would suffer severe censure if he kept on when definitely instructed to turn back.

COLONEL HARTNEY'S ADDRESS

Colonel Harold E. Hartney has been at work now for nearly two years with Senator Copeland's Committee whose final report has recently been issued. Captain Depew brought up many searching questions in reference to this report which he

(*Concluded on page 68*)

BRITAIN'S LONG-RANGE SHORT "SINGAPORE"

This sturdy four-engined flying boat is standard Royal Air Force Equipment.

Built for heavy open-sea work, the Short "Singapore III," shown above, is used throughout the British empire both by military and commercial air forces. Powered with four Rolls-Royce Kestrel engines of 630 horsepower each (a total of 2,520 horsepower), the Singapore III is used commercially for long-range load carrying over Britain's far-flung airline system. As a military aircraft the Singapore III is admirably adapted to patrol and reconnaissance work.

Maximum speed of this ship with a full load at 2,000 feet is 145 m.p.h. Stalling speed is 65 m.p.h. Its range at its cruising speed of 105 m.p.h. is 1,000 miles.

ANNOUNCE BENDIX RACE PRIZES

THE total prize money for the 1937 Bendix transcontinental speed dash will be $25,000.00. The announcement was made at the opening of the annual aeronautical exposition at which noted aviators from all parts of the country had gathered.

The Bendix race, prime flying event of the year, will be flown from the west coast to Cleveland this year, Mr. Sharlock stated. The date will be September 3. There will be separate prizes for feminine pilots and a cash bonus for any pilot who continues on beyond Cleveland, where this year's national air races will be held, and shatters the present coast-to-coast record.

"The prize money will total $25,000," said Mr. Sharlock. "There will be $2,500 for feminine pilots and another $2,500 for the pilot who smashes the coast-to-coast record now held by Howard Hughes. And $20,000 for the Bendix dash itself."

Mr. Sharlock outlined the general rules of the contest and stated that several of America's most famous speed pilots are already making preparations.

"We cannot say whether Mr. Hughes will be in the race this year or not," he said. "We do know that his airplane, one of the fastest ever produced is in perfect condition. The entrance of Michel De Troyat, famous French speed ace, has been announced. In fact, M. De Troyat has expressed a hope that he will have a chance to race against Hughes. We also know that our old friend Col. Roscoe Turner is preparing a new job for the race.

"Cecil Allen's rebuilt Gee-Bee is also expected to participate. Keith Rider has indicated his desire to compete and there are several others building new jobs and souping-up existing jobs for the event."

Whether or not feminine pilots will predominate this year as they did in last year's East-West event was problematical, Mr. Sharlock stated. However, they are eligible for the big prize money as well as the money offered for the feminine division and it is likely that the "powder puff" pilots will be at the starting line in September.

The present transcontinental airplane record held by Hughes, is 7 hours, 28 minutes and 25 seconds. Previous winners of the famous Bendix trophy are—1931, James H. Doolittle, average speed 223.058 m.p.h.; 1932, James G. Haizlip, average speed, 245 m.p.h.; 1933, Roscoe Turner, average speed, 214.78 m.p.h.; 1934, Doug Davis, average speed, 216.237 m.p.h.; 1935, Benny Howard, average speed, 238.704 m.p.h.; 1936, Louise Thaden, 166.060 m.p.h. Howard Hughes averaged 260 m.p.h. in his dash last January.

XUM

Flying In and Around Hawaii

by
LYNN C. THOMAS

Over the housetops of Honolulu as seen from the ships of the Inter-Island Airways.

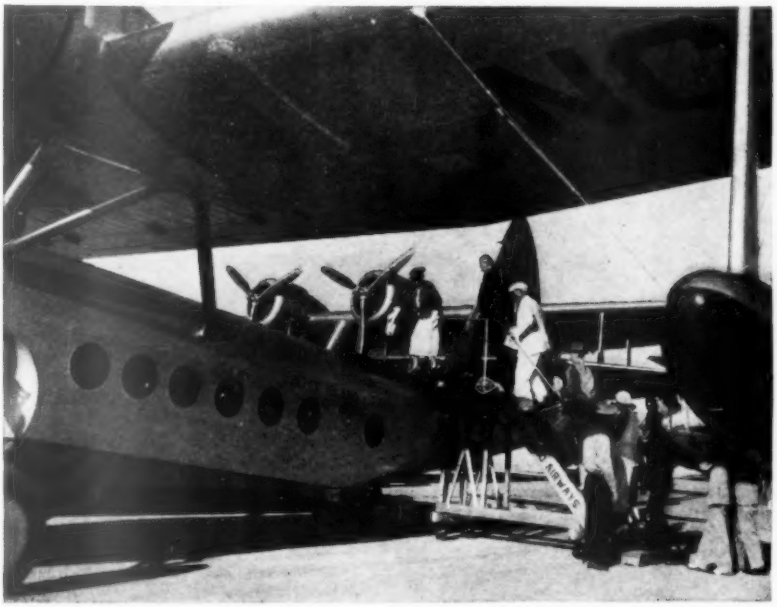
HAWAII! Paradise of the Pacific! When these words come before us the first thought that comes to our minds is the picture of a bevy of beautiful Hula girls running around on a moonlit beach with a grass skirt and a guitar. We can vision the little grass shack sitting back among the palms with a family grouped in front of it singing and dancing.

But again the Chamber of Commerce has us fooled. Honolulu, the principal city of the Hawaiian Islands, is one of the most modern and up to date cities it has ever been my pleasure to visit. With a population of over 150,000 people in Honolulu and of over 384,000 on all the islands of the group, it presents virgin territory for private and commercial aviation.

At the present time there is but one airline in operation between the various islands of the Hawaiian group, the Inter-Island Airways, formed seven years ago as a subsidiary of the Inter-Island Steam Navigation Co., Ltd.

At present, these planes have flown over two million miles without an accident to a single passenger or employe. During this time they have carried over 79,000 passengers, and since October of 1934 have been operating with a government mail contract. During the past year there has been an increase of forty per cent in the number of passengers carried over 1935. This big increase is on a par with that reported by airlines on the mainland.

The principal organizer of the air line which began active service in November of 1929, was Stanley C. Kennedy, president and general manager of the Inter-Island Steam Navigation Co., Ltd.



Loading passengers aboard one of the ships of the Hawaiian Inter-Island Airways.

Kennedy remained as active head of Inter-Island Airways, Ltd., until the latter part of 1936, carrying the company from the first day of operation through its outstanding record of seven successful years. In August of 1936, F. B. Connell joined the organization and is now actively engaged in its operation.

Connell has been closely identified with aviation since his graduation from Annapolis with the Atlantic fleet during the World War and later on the Pacific. He transferred to the aviation section in 1920 and was in that service until he resigned to enter private business. In 1928 he was recalled to active service as a Lieutenant Commander in charge of the Naval Reserve Aviation Base at Oakland, a position he retained until joining Inter-Island Airways, Ltd.

Starting with two S-38 Sikorsky amphibians in 1929, the company has steadily increased its flying equipment until today it is operating three Sikorsky S-38 and three S-43 amphibians. Using these planes they carry the mail and passengers on daily flights between the islands.

During 1936, Inter-Island Airways invested $500,000 for new equipment, including three S-43 Sikorsky amphibians, hangars, radio station and landing aprons.

The new S-43 Sikorskys cost more than $100,000 each. They are the first of their class. They have a cruising speed of 165 miles per hour, and a top speed of 185 miles per hour. These new planes are powered with two 750 horse-power Pratt & Whitney Hornet engines, and either one of the motors will keep the plane in sustained flight.

Structurally these S-43 amphibians represent the latest development in aerodynamic research. The planes are 50 feet long and have a wing span of 86 feet.

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Also the hull of the craft is divided into five water-tight compartments.

All of these planes are equipped with a Lear Homing Compass. With use of this compass there is no necessity for using a radio beam. Any broadcasting station, ship, or commercial station can be tuned in and by means of a visual meter the plane can be kept exactly on its course.

This ability to approach a directing station from any angle eliminates the trouble and hazards of hunting the narrow beam of the old fashioned radio direction system. With a Lear Compass, according to Mr. Kennedy, the course is just as direct and positive as if one were to plot it with pen and rule upon a map.

The hangars at John Rodgers Airport in Honolulu, incorporate the best features from leading mainland ports. Number three hangar built this year, for example, is of all steel type with huge rolling doors of steel and glass. They are 120 feet long and 120 feet wide, giving it a service area of 14,400 square feet.

While these planes are in the air they are in constant communication with the company radio station located at Honolulu. They also receive regular government weather reports as to conditions ahead.

Successful commercial air transport today involves large investments, highly trained personnel ground and aloft, efficient planes and motors, and a skillful, high morale organization. Inter-Island Airways has shown it is exactly that during the past seven years.

The organization has become the recognized aeronautical center for Hawaii. Late in 1935 the company opened a special domestic air transport office for booking services. Travelers from Hawaii may make their advance air booking services for all the world transportation lines before leaving Honolulu.

Today Hawaii is again living in the age of famous Clipper ships. As the early wind-blown Clippers with their tremendous expanse of canvas made the United States the leading commercial maritime power of the world almost a century ago, so today we have entered the second Clipper ship era. This second age is destined to repeat the glorious expansion of trade and commerce, of influence, or leadership which those early day clippers of wood and canvas gave us.

The first Clipper ships reduced the size of the world, so far as communication and transportation are concerned, by their superior speed over all other existing means. The Pan American Airways Clippers of 1936 are further reducing the size of the world, at the same time creating a modern unit for measuring distance. No longer need we state that Honolulu is 2,400 miles from the rest of the United States; rather, Honolulu is today less than 18 hours from the Pacific Coast. Advent of commercial air transportation has caused us to calculate distance as not so many miles, but as so many hours and minutes.

Early in 1931 three men met in a New York office to block out the general plan of the project. Those who knew them would have known they measured up to their task.

One was Juan Trippe, youthful president of Pan American Airways, which even then was operating more than 25,000 miles of important railway routes between the Americas. Another was Andre Priester, the line's brilliant Chief Engineer. The third was Colonel Charles A. Lindbergh.

Spread out before the three planners as though to emphasize the formidability of their project, was a huge map of the Pacific. They talked long hours of general features, then broke up to meet again and again through succeeding weeks.

Early in October, 1935, after three years of carefully guarded construction and testing, the first of the great Martin flying boats, built to the specifications of Colonel Charles A. Lindbergh, Pan American's technical adviser, and their engineers, and designed for trans-ocean service, was trundled out of her great hangar at the Baltimore plant of the Glenn L. Martin Company for her first public preview. She was named the "China Clipper." The "Philippine Clipper" and the "Hawaii Clipper" soon followed. They are the largest airliners ever developed in America.

The whole conception of a trans-Pacific air service was, of course, founded upon the existence of a chain of island "stepping stones" which broke the crossing into five stages. And, as mentioned before, four of the islands along the most ideal route to China belonged to the United States—Hawaii, Midway, Wake and Guam. But a dot on a map and permission to land on the island it represents don't make an air base. Each island would have to have a landing float, fuel tanks, an elaborate radio system, a crew to man the base, and facilities for housing and maintaining them.

Today the herculean task completed, hotels located at Midway, Wake, and Guam are in cooperation, presenting a service as efficient and pleasant as may be found anywhere in the world. The once uninhabited islands have become veritable paradises of comfort and beauty.

On February 22, 1936, airmail and air express service was inaugurated between San Francisco and Manila. The mail load for this first flight totalled 110,865 letters, more than double the "first flight" mail ever handled by the Post Office Department.

On October 12, 1936, the first scheduled passenger left California for a flight to Manila. This marked the formal opening of the world's greatest trans-oceanic air line.

Indicative of the foresight of the System's executives is the fact that even before passenger service started, contracts were let with the Boeing Aircraft Company for the construction of six new planes, 50 per cent larger than the present Clippers, and with a higher speed rating. The first of these planes will be ready late in 1937.

Thanks to the Pan American Airways schedule which calls for a Clipper to arrive in Honolulu from Manila every Sunday afternoon, the populace has a definite objective for the regular Sunday afternoon motor trips. Hundreds of persons drive from Honolulu to the airport to see the Clippers come in from the northwest.

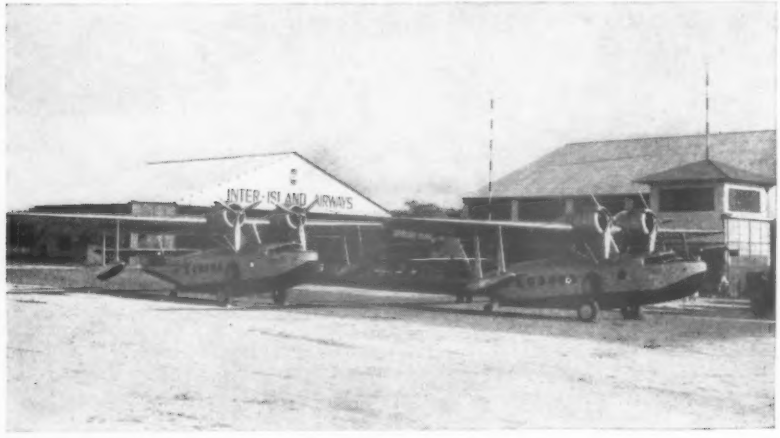
At the Pan American Airways Base in Honolulu, the buildings and grounds have been given a "new face" with a coat of paint for the porch decks and inside halls of the upper offices. With the addition of a new walkway to the barge and new fence rails the terminal takes on a very efficient and business like appearance.

And it is beautiful, too—collectors of hand-carved teakwood from China would find many of the decorations of the terminal building almost irresistible, for after looking over all available locations for a base, Pan American officials leased the former home of R. W. Atkinson on the shores of Pearl Harbor. Although the furniture was removed to be replaced by the more business like steel desk and files, the elaborately carved woodwork remains exactly as it was when Kings and Queens were guests there 38 years ago before the islands became an American territory.

Around the buildings are 2½ acres of beautiful landscaped lawn. Tall palm trees, orchids and tropical plants, shrubs and flowers make the entire base a delightful spot.

The operations offices are maintained on the second floor while the main floor is given over to offices of Inter-Island Steam Navigation Co., Ltd., general traffic agents for Pan American Airways in Hawaii;

(*Continued on page* 61)



Two of the flying-boats employed on the Inter-Island Airways of Hawaii.

Heads Women's Traffic Division

by B. B. GRAGG
Sales Manager, United Air Lines

A scheduled airline opens a new opportunity for women in aviation which promises to be of great benefit to airline traffic departments. Full details are given here as to the duties and demands of this department.

OUTSTANDING in the development of the air transport field during the past few years has been the widespread acceptance of airline travel by the fair sex.

Less than five percent of the passengers carried in the pioneering days of air transportation were women and this has been steadily increasing. Today, a review of the United Air Lines traffic figures for 1936 reveals that thirty-three percent of the passengers were lady travelers.

Behind this steady rise is a methodical campaign that has been developed over a period of years to make air travel enjoyable and comfortable for women. Seven years ago United recognized the importance of having a service that appealed to women and pioneered in the air transport world by placing registered nurse stewardesses on its planes. This resulted in a marked increase but even more features were needed.

The cabins were noisy, it being necessary to wear cotton in the ears to lessen motor noises. This was an objectionable feature and women constantly complained that they didn't enjoy their trip because the plane was too noisy. Aircraft engineers were then experimenting with sound-proofing devices.

The heating and ventilating of cabins was uncertain and unsatisfactory. Sometimes passengers were cold and then too warm. It was difficult for women to know how to dress for their trip. Food, when it was served, consisted of cheese sandwiches, potato chips and fruit. These conditions were gradually improved until today, when these ships offer the ultimate in passenger comfort and luxury for men and women air-farers alike.

The Mainliners, built by the Douglas Aircraft Company, are quieter by actual test, than a railroad sleeping car. Motor noises are a thing of the past and normal conversation can be readily carried on in the cabin. So much so, in fact, that a conversation in the forward part of the large Mainliner can be easily overheard in the rear.

During these years we have been principally interested in the many questions that are asked by the woman who is making her first trip by air. One of the first things she asks is about her clothes. What can she wear? From coast-to-coast these women are told that anything they have can be worn, though tweeds and knits and rough silks that don't crumple are found to be the most desirable by the experienced woman air traveler. A hat that hugs the hair is also desirable and, in the winter-time, women are advised to carry a warm coat that should be worn when stepping from the warmed cabin.

How much luggage can I carry? That's another popular question. A limit of 35 pounds is carried free by all air lines today and a large piece of luggage of this weight can be packed to include a surprising number of clothes. A woman flying from New York to San Francisco and then connecting with a Pan-American Airways Clipper to Honolulu told one of the stewardesses, recently, that she was carrying exactly 35 pounds of luggage and had more than enough clothes for her two weeks' vacation.

Mothers are anxious to know if their children should be taken on air trips and, if so, how old should they be before flying. Youngsters, we have found, are enthusiastic about flying. As far as age is concerned we have the example of a young mother who took her twelve-day old son with her and said the trip was "just a good nap for the baby." Stewardesses provide the food the youngsters need and amuse them during the flight.

Miss Helen Stansbury, Director of Women's Traffic Division, United Air Lines.

The first rider wants to know what flying feels like. This is comparatively easy to answer, since there is no sensation of great speed in a plane, even though the trip is unbelievably fast. On the large planes, many diversions that particularly appeal to the ladies, are enjoyed as these twelve-ton, three-mile-a-minute transports speed to their destinations. The aisles are wide enough to permit a full-sized bridge table to be set up and the swivel feature of the overstuffed chairs permits the lady to swing about to face her bridge or game partner.

Shortly after non-stop service between New York and Chicago was opened, one stewardess reported that, on a single trip, three bridge games were in progress. In fact the only complaints made by women passengers on this division has been from those who say that the flight is too fast and does not permit them to play enough bridge rubbers. Only three hours and fifty-five minutes are required.

An even temperature is maintained in the cabin by the thermostatic control on the heating unit. A constant reading of 70 degrees is noted, regardless of the outside temperature. Another feature of the Mainliner service which has instantly appealed to the woman air traveler is the overnight kit which is furnished each lady. It is designed for practical use and is indeed pleasing to the eye.

This kit is made up of blue-strip satin and has a rayon fabric lining. The contents include: a jar of make-up foundation cream, a box of transparent powder, a powder puff and quick-cleansing lotion. Each Mainliner has individual dressing rooms for men and women.

To further promote interest amongst potential women air travelers, United Air Lines has established a woman's traffic division. Miss Helen Stansbury, daughter of a socially-prominent Baltimore family, has been appointed director of this department and becomes the nation's first coast-to-coast flying woman executive. She covers 10,000 miles each month by plane, covering the 35 cities in 15 states in which United has offices. She spends considerable time addressing women's organizations, explaining air transportation.

The hot meals have won instant approval of the ladies. The average hostess would say the serving of a full course dinner to fourteen to twenty-one guests from a three by six foot kitchen is impossible. She would also say that twenty-one people could not be served a meal in an hour and ten minutes. But these feats are being accomplished daily. There has been such an evolution in the preparation and serving of meals, that certain airlines, like trains, are now boasting of their menus.

The serving of a full course dinner is frequently a problem as only two hours are required for a flight between Los Angeles and San Francisco, Cleveland and New York and other points, although they are hundreds of miles apart. Service is perfected so a stewardess can serve twenty-one people within an hour and ten minutes, or three minutes per passenger. The meal is assembled on the ground, packed in special containers. Each passenger has an individual table or swivel chairs can be turned around for two or four people to dine together.

A typical dinner includes fresh fruit or shrimp cocktail, celery hearts and mixed olives, a choice of fried chicken or lamb

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Aero Engine Maintenance
by HERBERT MARSH

THE material used for valve seats has to be considered when deciding upon the angle of the valve face. If the angle is too acute, the tendency may exist for a swagging action to occur which would tend to spread the seat, or if the angle be excessive, it will cause the valve to have a tendency to bind in its seat. Valve seat angles are more nearly horizontal than vertical. The most common seat used in composite air cooled cylinders is the aluminum bronze insert.

Unless special facilities are available it is not recommended to try to replace inserts. The cutting of the valve face and reducing of insert is the usual amount of service required in the overhauling of cylinders.

When servicing rocker arm assemblies the bearings, if ball type, should be removed, cleaned, and inspected for wear. Check for flat spots, broken balls, or cracked races. Clean out any oil ducts that may be incorporated in the rocker and reassemble. Replace all felts or oil retainers.

If rocker arm strikes the valve direct it should be examined for wear at point of contact and any depression that may exist through rocker arm striking valve, should be ground out. Rocker arms that carry rollers for opening the valves should be checked for wear on roller pins, also check roller for flat spots or cracks. Check rocker arm for wear at push rod end.

Check tappets for irregular surface and reface if necessary. If tappets are adjustable check threads and means of fastening. After assembly check rocker and see that it moves freely without undue drag or tendency to stick. In final adjustment of tappets on complete engine assembly it will be noted that some motors have two clearances, one of which is used only for timing purposes.

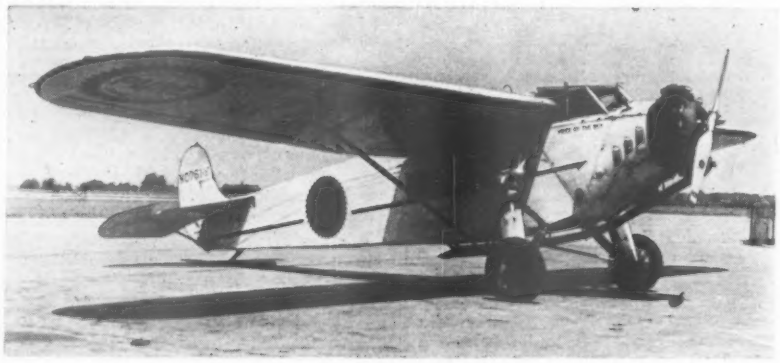
Valve springs may lose some of their strength due to heat and vibration. For this reason each spring should be tested individually for strength under pressure. This is done by compressing the spring to a certain point on a scale, which registers the pounds of pressure required to hold the spring at this point. Manufacturers' specifications must be consulted and the springs tested accordingly.

As we cannot give a detailed account of the servicing of all individual parts, we arrive at the following conclusions:

An engine should be reduced to as many sub-assemblies as possible, each sub-assembly becoming a major component and then broken down as far as possible. After sub-assemblies have been serviced, they resolve into one final operation, meaning final assembly. However, we may now vote that the last major operation is purely assembly and no consideration, or perhaps I should say concern, need be given to the sub-assemblies as to their air-worthiness.

In conclusion, I might add that the Department of Commerce Bulletin 7, 7A and 7H should be available at all times, due reference to same being given and the instructions therein carried out specifically.

This Plane Carries "Voice of the Sky"



The Fokker monoplane that carries a public address system for advertising oil.

ABOVE is a view of the Fokker monoplane that has just completed a three year tour of the United States, east of the Rockies, in an oil company advertising campaign.

It contains the "Voice of the Sky" comprising a two hundred watt audio output public address system, with amplifier, power supply and speakers all contained in the ship. Entire current supply is available from wind driven generators which can be seen on the wing struts.

Definitely an engineered product for this particular job, this outfit is of such power that its regular operating altitude is from two to four thousand feet. On one record day it was distinctly audible to listeners six miles from the town over which the "skycasting" was being done!

Total weight of the equipment is in the neighborhood of five hundred pounds. This famous old ship with its thousand pound payload, built in '31, powered with a Wright J6-9 cruises at 110 mph and, when the amplifier is in operation can be throttled back to "float" at 55.

The value of this type of craft and equipment lies not in advertising alone. Imagine its usefulness in times of national disaster, flood, fire and rescue work. Or indeed in any capacity where a mass direction of individuals is needed from a central all-seeing source.

Some time ago the British Government fitted out a similar ship to quell an uprising of natives in India. Phonograph records were broadcast warning them to lay down arms and restore peace. The voice of the "great Bird" was so effective that the uprising was quelled bloodlessly.

Cut shows the relative layout of components as placed in ship illustrated. Efficiency is the watchword.

Plan a World Voyage in a "Cub"

FAR away India is the goal of a proposed flight expedition which Major Merrill K. Riddick, Airport Manager at Dansville, New York, will command this coming summer. He will be accompanied by Edward E. Coon of Hamburg, New York (who, incidentally, soloed in 1 hr. and 20 min.), and Dr. George Johnston, a health aid.

They will not cover the 15,000 miles in transports or seaplanes but intend to use "flivver" planes, Taylor Cubs, built at Bradford, Pennsylvania. They will be equipped with four-cylinder motors and will have a cruising radius up to 1000 miles each on the gas they will carry. If the tests of the one-bladed propeller, described in the May issue of POPULAR AVIATION, continue to prove successful, the Major anticipates their use instead of the usual two-bladed prop.

Major Riddick intends to guide his group cross-country to California, along the Pacific coast to Alaska, across the Behring Straits, down the coast line to China and southwest across China to Bombay. He has studied the route carefully and took three years in covering it by foot, boat, dog team and with snow shoes as far as Asia.

He started out "broke" and made his living by panning gold, cutting wood and doing various types of labor.

He claims, "It was darn tough when up in that country to pull up stakes when one had a job and invest in grub, put on the pack and strike out on up the line as far as one could go. It was hard to live off the country, but harder to figure that I could get a plane in which to make the trip, even though I did find a practical route."

However, with this experience as background, Major Riddick plans for each of his students who enrolls on the expedition to fly his own Cub, loaded with food, medical supplies and 40 gallons of gasoline. Each plane will also carry a pup-tent and equipment to make comfortable camp. The group intends to visit mining properties in British Columbia and engage in fishing and big game hunting in Alaska and sight-seeing in Siberia, China, Siam and India.

XUM

How Much Power Does a Bearing Absorb?

Lay a straightedge across this chart three times, as indicated by the dotted lines, and it will give the horse-power consumed by any bearing, coefficients of friction varying from .0006 to 0.6; shaft diameters from 0.1 to 10 inches; r.p.m. from 100 to 10,000; and the load on the bearing from 10 to 10,000 pounds.

For example, using a coefficient of friction of .02 (column A), which is average practice; a shaft diameter of two inches (column C); a speed of 2,000 r.p.m. (column E), and a 400-pound load on the bearing (column G), column D gives the friction horse-power as a little over 0.25.

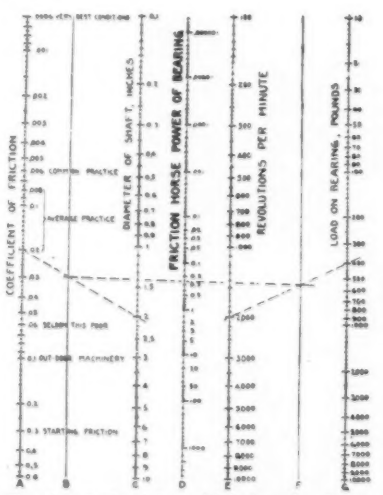
Connect the known value in column A with the known value in column C and locate the intersection with column B. In the same way connect columns E and G, and locate the intersection with column F. Lastly, connect the intersections (columns B and F), and the intersection with column D gives the friction horse-power of the bearing.

Column A gives an idea as to co-efficients met with in every-day practice, beginning with the very best conditions and ending with starting friction.

Co-efficients of friction under the many possible conditions are given in text books, in Alfords' "Bearings," and in such handbooks as "Kent" and Marks' "Mechanical Engineer's Handbook."

Only the general safe values of practice are designated on this chart. The principal function of the chart is to quicken the making of computations for anybody who has to do with bearings.

The chart, of course, can be used backwards as well as forwards. Thus if the power absorption by a given bearing is known, and if values on columns C, E, and G are known, the coefficient of friction is quickly determinable. Then, knowing the coefficient of friction with a given oil and in a given bearing, the power required by a similar bearing of different diameter, speed, and loading may be found with an accuracy sufficient for most practice.



Graphical chart by which bearing losses can be computed.

Specifications of the Aeronca C-3

This Type C-3 is a departure from the first Aeronca.

FOR a number of years the Aeronca C-3 has been easily distinguishable from other lightplanes and has done a great deal to put private flying within easy reach of nearly everyone. One of the reasons for this unusual success is doubtless the fact that it was built in connection with the Aeronca engine, also produced by the same company.

After the introduction of their low-wing model in 1935, it was decided that a new ship was needed to replace the C-3, and in which would be eliminated several features of the C-3 that were becoming outmoded. Chief among these were the struts above the wing for the numerous brace wires, which were also used under the wing.

The new Aeronca which has just made its appearance is known as the model K, a high wing cabin ship with side by side seating. A simple method of strut bracing firmly secures the wing. The two cylinder, horizontally opposed and air cooled Aeronca engine is used as the power plant, with a very economical gasoline consumption of only 3 gallons per hour. A mere quarter pint of oil per hour is necessary for proper operation.

Although the normal Department of Commerce rated output of the Aeronca E-113C engine is 36 horsepower at 2,400 r.p.m., an increase to 40 hp. can be had by boosting the r.p.m. to 2,500, at which speed the manufacturers rate the engine. Beside the same engine as the C-3, the new model K has the same overall span and wing panel, with only a difference of a few inches in the length.

At this point, however, the similarity ends, and the Aeronca K emerges as a much cleaner ship than its predecessor. The fuselage differs greatly from the low C-3 fuselage which reminds one of a pouter pigeon; it is quite a distance off the ground, as is standard practice. Replacing the stubby gear on the last model of the C-3, the Aeronca K has a modern single strut oleo landing gear.

This is the first time that an advanced type gear of this sort has been used on a lightplane. This higher gear lets the fuselage easily clear tall grass and gives an increased angle of attack to the wing when in position for landing. The resulting increased air resistance gives a braking effect which cuts both landing speed and roll after making contact with the ground. A new tail skid also helps to make the ship practically shockproof while landing and taxying.

The fuselage itself is exceptionally roomy, with entrance through a door on the right side. The seat is rounded off at this side for easy access to the cabin, whose floor is free of cables, control sticks, and other obstructions. This is possible because of the placing of dual control wheels in the ship for the first time in a lightplane. These extend out from the instrument panel on short arms at a convenient and comfortable height.

The rudder pedals are under the instrument panel, and in this position give much leg room. The full seat width is 35 inches and the upholstered cushions and back rests are at the correct position and angle for effortless flying. The sloping windshield and large windows give visibility to the front, sides, downward, upward, and even to the rear. Side windows are of the automobile type, with an easy raising and lowering mechanism.

The large instrument board has all the basic flying instruments, with room for the installation of more, or radio if desired. The entire board is well lighted for easy reading while on night flights. A centrally located push-pull throttle control is easily reached by both occupants. An adjustable tab on the elevator keeps the plane in correct flying position, even when weights vary due to the consumption of gas and oil during a flight. To the rear of the seat is an especially large baggage compartment.

Steel tube in a streamlined shape is used for the wing struts. The bracing for the tail surfaces utilizes steel tie rods. To finish off the new Aeronca K, a gleaming finish in the Aeronca color scheme of yellow with black trimming is applied over the fabric covering.

Specifications of 1937 Aeronca K high wing monoplane.

POWER PLANT

36 hp. Aeronca E-113C (at 2,400 r.p.m.)

DIMENSIONS

Overall wing span	36 ft. 0 in.
Overall length	20 ft. 7 in.
Overall height	6 ft. 7 in.

WEIGHTS

10 gallons of gasoline	60 lbs.
3 quarts of oil	6 lbs.
Empty weight	590 lbs.
Useful load	450 lbs.
Gross weight	1040 lbs.
Baggage	44 lbs.

PERFORMANCE

Top speed	93 m.p.h.
Cruising speed	85 m.p.h.
Landing speed	35 m.p.h.
Rate of climb	450 ft. per min.
Gliding angle	10 to 1

XUM

HUGE CANADIAN AIRWAY PROJECT

by HAROLD H. HILLIARD

Part II

This Wasp-powered Fairchild is being used in the pioneering work now being completed on the trans-Canadian airline.

IN the United States 75 percent. of the revenue derived is from passenger traffic and the remaining 25 percent. from mail and express, so it will be the prime object to make Canadians air-conscious so that they will travel by air as it is quite likely that much the same figures will be necessary in Canada to operate profitably. It will be important that the air corporation should bring fares down to a level with the railways just as soon as possible, although this is not likely right at the beginning.

As to the safety factor in airplanes, Canada has an exceptional record in this regard. In fact figures prove that one can fly with much more degree of safety than travelling by any other mode of transport, car, train or boat. In Canada's aviation history there have been comparatively few fatalities from air crashes and most of these have occurred in planes not associated with commercial companies which have maintained a most remarkable record.

In the mining areas of Patricia district of North Western Ontario where commercial aviation in Canada was born, where the bulk of the flying is still being done, and where the busiest airport in the world, Hudson, is located, as proved by government figures there has never yet been a person killed in a plane accident although machines of one of four companies operating in the district have carried 20,500 passengers, 8,000,000 pounds of freight and 1,000,000 pounds of mail during the past 10 years. Two only have been injured.

The Trans-Canada air service when established will, within a few years, become an important link in a round-the-world Empire lane. Imperial Airways plans to conduct test-flights from England to Newfoundland during 1937 with a view to establishing a Trans-Atlantic service to connect England with Canada. With the Trans-Canada route established there would then be only the Trans-Pacific jump to be linked—that is between Australia and Canada, before a person could fly all the way around the world, never landing on anything but British soil. The present services established by Imperial Airways run from London to Egypt, to Cape Town in South Africa and thence to Australia.

Mr. Howe, Minister of Transport, in an interview stated that the objective would be to set up an air service in Canada as fine as any in the United States as quickly as possible. Mr. Howe recently completed a flight from Ottawa to Vancouver via the American airlines and was much impressed with the efficiency and comfort. He is confident that Canada can develop as fine a service. Hostesses will be carried for the comfort of passengers but whether planes will be immediately equipped with berths for night travel has as yet to be decided.

Mr. Howe has made it plain when questioned regarding Pan-American Airways' interest in Canada that the Trans-continental service must be all-Canadian. No outside influence will be allowed to secure a footing in the corporation. No doubt some help of an advisory capacity may be called upon but the financial control will be kept entirely within Canada.

Even with the delay in establishing Canada's Trans-continental air service in the interest of economy, it can be said that aviation in Canada has gone ahead with remarkable strides. The first flight ever made in the British Empire is credited to a Canadian, J. D. McCurdy, who performed this feat in Nova Scotia. Following the war years the airplane was practically forgotten in Canada although Canadian pilots accomplished the greatest feats during the war of any Empire flyers. Pilots came back from Europe with no flying jobs to go to so they went elsewhere to work. However, a spark still glowed and, when opportunity offered, some of them were quick to grasp it.

This opportunity came to a few fliers in 1922 when the first commercial use for airplanes was inaugurated by paper mills in northern Quebec for timber-cruising expeditions. The next step forward was the establishment, in 1924, of the Ontario Provincial Air Service to patrol the province's timber lands and assist in fighting

(*Concluded on page 62*)

New M.I.T. Wind Tunnel

AN aeronautical wind tunnel, designed to develop wind velocities of 400 miles an hour and simulate atmospheric pressure at an altitude of 35,000 feet is to be built by the Massachusetts Institute of Technology at Cambridge, Mass.

It will be used for research by the Institute and will also be of value to the aircraft industry as a whole in the solution of problems of design. The tunnel will be named in honor of the Wright brothers and will be located on a site near the aeronautical laboratory donated to the institute some years ago by the Guggenheim family.

Details of design for the tunnel have not been disclosed, but the structure will embody a number of new features. A 2,000-horsepower steam turbine will generate power to whirl a huge fan for high-wind velocities.

Because of the requirement for varying air pressure, the tunnel will be built of welded ship steel in much the same manner that a submarine is constructed. Its 10-ft. diameter will permit testing models of 8-ft. wing spread. Control of air pressure in the new tunnel will make it possible to test full models or wing sections of full size planes under flying conditions that would be encountered at sub-stratosphere altitudes, or heights of nearly seven miles, where barometric pressure is approximately a quarter of that at ground level.

Ort's New Catalogue

KARL ORT'S 1937 aviation supplies catalogue is something to be kept on the bookshelf and looked at when something unusual is desired for reading material.

The new Ort catalogue is a catalogue, all right, but it's a publication the likes of which folks in the aviation industry won't see for some time to come. There are almost life-size photographs of fine, clear texture that ably illustrate the Ort wares. Ort, we understand, writes all his own copy and believe us it's colorful enough so that only an Ort could be its author.

The new catalogue contains all types of aeronautical equipment, clothing and knick-knacks. The book's price is ten cents and can be obtained from him at 690 Poplar avenue, York, Pa.

Our Back Cover

POPULAR AVIATION'S staff photographer, N. R. Strohmeyer, got the back-cover photograph in natural colors of a Boeing P-26A of the 94th Pursuit Squadron at Selfridge field, Mt. Clemens, Mich.

At the time this photograph was made the air corps was making elaborate cold weather equipment tests with the various types of aircraft stationed at that army base. Incidentally, it is reported that the trusted old low-wing Boeing fighters soon may be replaced by the ultra-modern Seversky P-35 fighters now under construction at the Seversky factory at Farmingdale, N. Y.

XUM

Safety in Triangulations

by

RAOUL J. HOFFMAN

Aeronautical Engineer

THE principle of designing structural units, especially airplane structure, is the transmission of a load to the suspension points with a minimum weight and a minimum number of parts.

The magnitude of the deflection should be small; it is always present when members are stressed, but should not introduce new secondary stresses that were not originally taken into consideration when dimensioning the structure.

The simplest transmission of a force is through a member in tension; the weight is directly proportional to the length of the member. A unit in tension is the lightest structural design possible.

Reversing the direction of the force and keeping it in line with the axis of the member, will place the member under compression. The weight of the member will now increase faster than its length. Therefore, in connecting structural parts, the part under compression should be made shorter than the one in tension. (Sec. 1.)

Placing the line of force square to the axis of the member and beyond the supports results in a cantilever beam. Sec. 2 shows a loaded cantilever I-beam; the load creates bending stresses that place tension in the upper flange and compression in the lower flange; the shear forces are transmitted by the web of the beam.

Using the same force and support conditions, and replacing the I-beam by two members, as shown in sketch, the load will put tension in the upper member and compression in the lower member; the shear appears only as a component of the members at the supports.

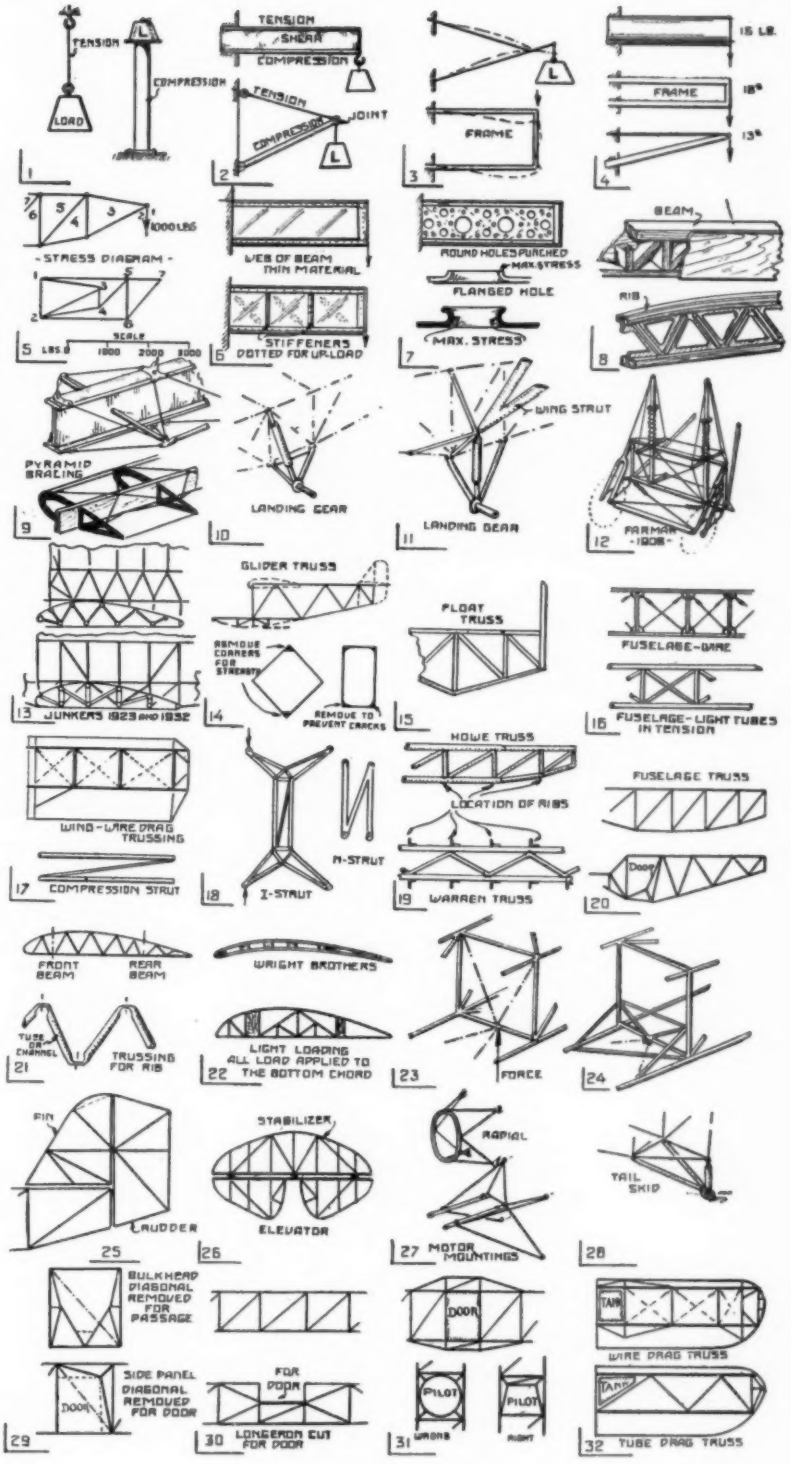
The forces in this simple structural combination are easily computed if the load is applied at the joint, the point of intersection of the center lines (neutral axes) of the members.

The stress estimation becomes more complicated if the load is moved past the joint, as shown in Sec. 3, for new bending stresses are added that will increase the size of the members and consequently increase their weights.

Sec. 3 shows another combination of members, the unbraced frame design. Load will deflect an unbraced frame a great amount; therefore it is not suitable for airplane designs.

Comparing the weights of the three structures, the weight of the angular truss will be the lowest, if a certain loading condition is assumed; one example is indicated in Sec. 4.

This leads to a deduction that, by resolving the force into two new forces, or by



Various examples of structural triangulations as applied to airplanes and similar structures. Trusses, it will be noted, are triangulated beams.

XUM

sending the load through two new members, continually added, towards the supports will make a very light structure possible.

Sec. 5 indicates the simplicity of graphic estimation of stresses in a structure statically determinate. The structure is statically determinate if the number of members is equal or smaller than twice the number of joints less three. Taking for example the number of joints to be 5, then the number of members should be seven or less.

In case the number of members is higher, the above method can not be applied. For space frame structures that have members in three directions the number of members to be equal or smaller than three times the number of joints (less six), in order to be statically determinate. Usually the main forces are resolved into forced laying in one plane and the forces from each plane added to get the resulting force.

The previously mentioned unbraced frame may be reinforced by attaching a very thin sheet of material. Loading this frame, corrugations will appear at certain intervals and at a certain angle, which is close to 45 degrees, as shown in Sec. 6. These 45 degree shear lines are very obvious on the walls of a building that is under stress.

Adding loads to the reinforced frame will over-stress it if stiffeners are not added at a distance about equal to the height of the frame.

Frames placed under load acting up and down, their unstressed web portion removed by punching round holes, give a theoretical design similar to the one shown in Sec. 7. It should be mentioned that punched holes must be round- flanged or rolled in order to prevent arting of cracks; this operation is r quired for webs that are over-dimensioned.

The 45 degree slope of the corrugations on the web member is the reason for placing the grain in a plywood at that angle. Sec. 8 shows application of the frame and plywood combination in designing a wooden spar and a wooden rib.

Viewing all mentioned above from analytical standpoint the trend of efficient structures is towards angular combinations; these combinations include the thin webbed frames that create their own angular folds.

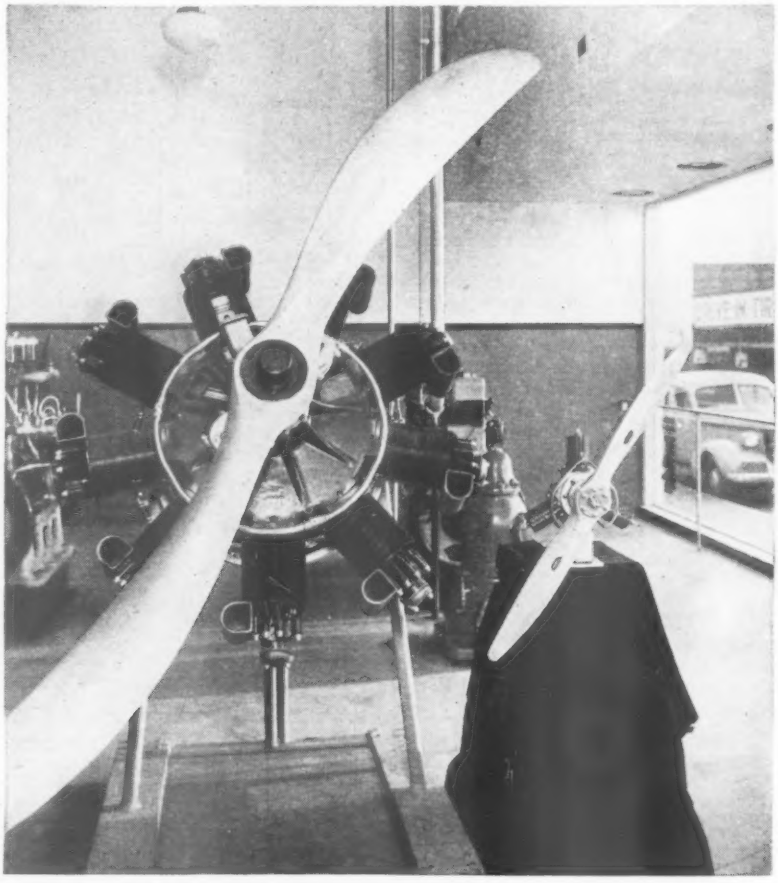
This relative placement of members—the fold in the web is considered a member—continually radiating from each consecutive point (joint) may be designated under one term: triangulation. At least three members should meet at each joint forming a tripod with another one transmitting the load. In panel layouts at least two members must meet at a joint and one or two transmitting the load.

This triangulation is carried out for landing gears shown in Secs. 10 and 11. Section 12 shows a landing gear of 1908, which we may call "overtriangulated." This landing gear had a tendency of preventing a take-off when tall grass covered the airport or the grass was dew-covered.

The early Junkers machine were overtriangulated, but lately the zig-zag designed spars were substituted by spars with

(*Concluded on page* 66)

Successful Midget Aircraft Diesel Built



A comparison of the midget aircraft Diesel built by Keene and the 185 h.p. Packard Diesel at the left.

CREDIT for building the world's smallest aircraft Diesel engine, that operates successfully on crude oil without spark plugs or carbureter, is claimed by Charles Keene, Los Angeles.

His engine is a 3-cylinder, 2-cycle, radial air-cooled model that develops 6⅓ h.p. at 2000 r.p.m. Weighing but 18 pounds, it operates on a compression pressure of 460 pounds per inch—a ratio of 16:1.

The 3-ounce pistons, complete with piston rings, are 1½" diameter. The stroke is only 1⅞". This compares in size to some of the smaller outboard motors rated at 3-3½ h.p. and which weigh 20 to 25 pounds.

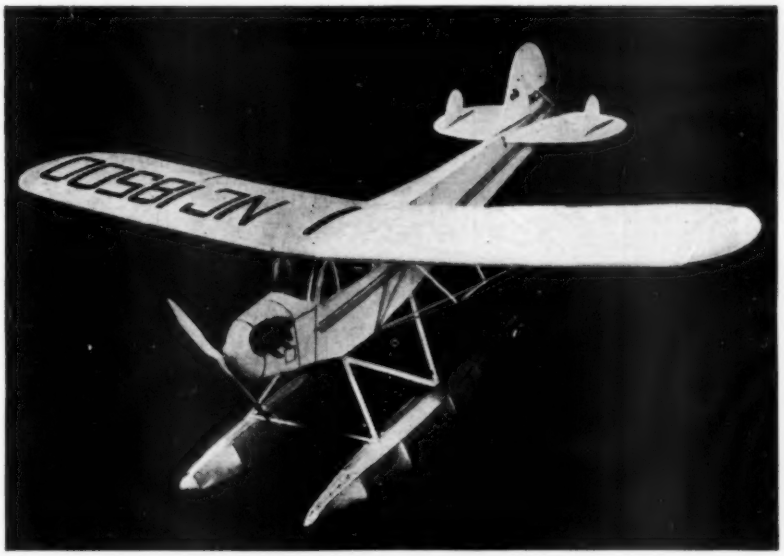
Keene has designed a highly ingenious fuel injection system and developed a number of outstanding features, according to Diesel engineers who have seen the engine operating.

While the engine is too small for use in airplanes, Keene states that he plans to build a larger engine for use in small airplanes, patterned after this model. Only one other Diesel engine as small as this one has ever been built before, to the best of the knowledge of Diesel engineers. It was a single cylinder Diesel, developing about 3 h.p. and weight 34 pounds.

Charles Keene with the midget Diesel engine that he designed and built. The engine burns Diesel fuel oil without spark-plugs.

Building the Taylor Cub Plane

by
PAUL W. LINDBERG
Popular Aviation
Model Editor



The finished model, complete with pontoons.

NOW that Summer is here, we know you will be more than anxious to build this trim model. Go out to any small pond or lake and enjoy a real thrill flying your Taylor Cub. We think it is a beauty and so will you, so, let's get busy, fellows!

COLOR SCHEME

Entire model—Yellow with Red trim; Pontoons—Top and sides—Silver; Bottom—Black; Details—Black.

CONSTRUCTION OF FUSELAGE

In order to prevent the framework from sticking to the plan, we advise you to use a sheet of ordinary wax paper between the framework and on top of the plan.

We suggest that you begin with the fuselage, which is constructed one side at a time. The longerons, vertical and diagonal, etc., are held in place until securely cemented. This is done by inserting straight pins on either side of the strips.

When the fuselage sides are completed, they are pinned to the top of the plan, in such a manner, that the top longerons face down and the sides are at right angles with the table. The cross members are now cemented in their places forming a rectangular fuselage.

Cut formers from sheet balsa and cement in their respective positions. There are only a few of these formers attached to the fuselage and little difficulty will be encountered here. Refer to plan for exact sizes.

CONSTRUCTION OF WINGS

This wing is made up of two separate panels. Cut all ribs from 1/16″ balsa. Pin the spar in position on the plan. Now, cement the ribs in their proper locations.

The leading and trailing edges are cut and sanded to shape, then cemented to the ribs. The panels carry movable ailerons, which are a great help in controlling the flights.

Make wing tips from 1/16″ balsa. We highly approve of this type wing tip, because it is much easier to construct and neater in appearance.

CONSTRUCTION OF PONTOONS

From sheet balsa, construct the center member of the pontoon. Dotted lines indicate depth of sheet balsa. 1/16″ square framing is cemented in as shown on plan. You will note that the formers are cemented to either side of center section forming keel of pontoon. 1/16″ square stringers are carried from front to rear.

CONSTRUCTION OF ELEVATOR AND RUDDER

These are made from 1/16″ square flat balsa and are cemented on the plan. Their construction is easy, therefore, you should have no difficulty here. In covering the elevator, it is important that the two units are covered separately in order that they may be inserted in slot at rear of fuselage. The aluminum hinges are inserted after they have been placed in the rear of the fuselage.

CONSTRUCTION OF MOTOR

The cylinders are carved from solid balsa and are wrapped with heavy thread to imitate fins. Push rods, etc., are added.

COVERING THE MODEL

Do not attempt to cover the model with the framework completely assembled. Cover wing panels separately as well as other parts. After the framework has been covered, to shrink tissue, apply coat of water.

ASSEMBLY

Attach wing panels to top of fuselage cabin by cementing them in place. The wing struts are now attached as well as the pontoon struts. The windshield and windows are cemented into position after model has been completely painted.

TESTING AND FLYING

Two types of propellers are used on this model. One is made of fiber, which has a much wider blade, causing the rubber motor to turn at less r.p.m., and enabling the model to fly greater distances.

By twisting the blades, the pitch can be easily adjusted. The balsa scale propeller is used for exhibition purposes only.

Six strands of ⅛″ flat rubber are sufficient to fly the model.

With the rubber motor and flying propeller in place, gently launch your model over tall grass to see whether it is properly balanced.

This latest model of the Taylor Cub was chosen by POPULAR AVIATION for the current model-of-the-month as well as the front cover subject because of the current widespread interest shown throughout the aviation world toward this little airplane.

The Taylor Cub has, since the Taylor Aircraft Company was incorporated in 1931, become one of private flying's most famous of light aircraft. From a meager beginning with but a few models sold, the Taylor Cub has climbed steadily in popularity and demand. The company's approximate output for 1936 was 650 airplanes which today are flying in all corners of the world.

Originally, the Taylor Cub was the brainchild of C. G. Taylor who recently, however, broke away from the original company and set up a company of his own at Butler, Pa. The product of this company is called the Taylorcraft and is almost identical with the original Cub with the exception of its side-by-side seating. The Cub has tandem seating arrangements.

The Cub on floats makes an ideal ship for the private pilot to fly up to his favorite lake or fishing stream. A week-end flight to a secluded lake in the north woods now requires the mere piling aboard of food for a couple of days, an air mattress and fishing tackle. For further details concerning the new Cub see page 22 of this issue.

If model glides a short distance and nose rises abruptly, it will be necessary to add weight to the bottom of the nose. If model dives, add weight to tail.

After the model is balanced to glide at an even angle, you are ready to test your model under power. A few trial flights will acquaint you with your model.

END

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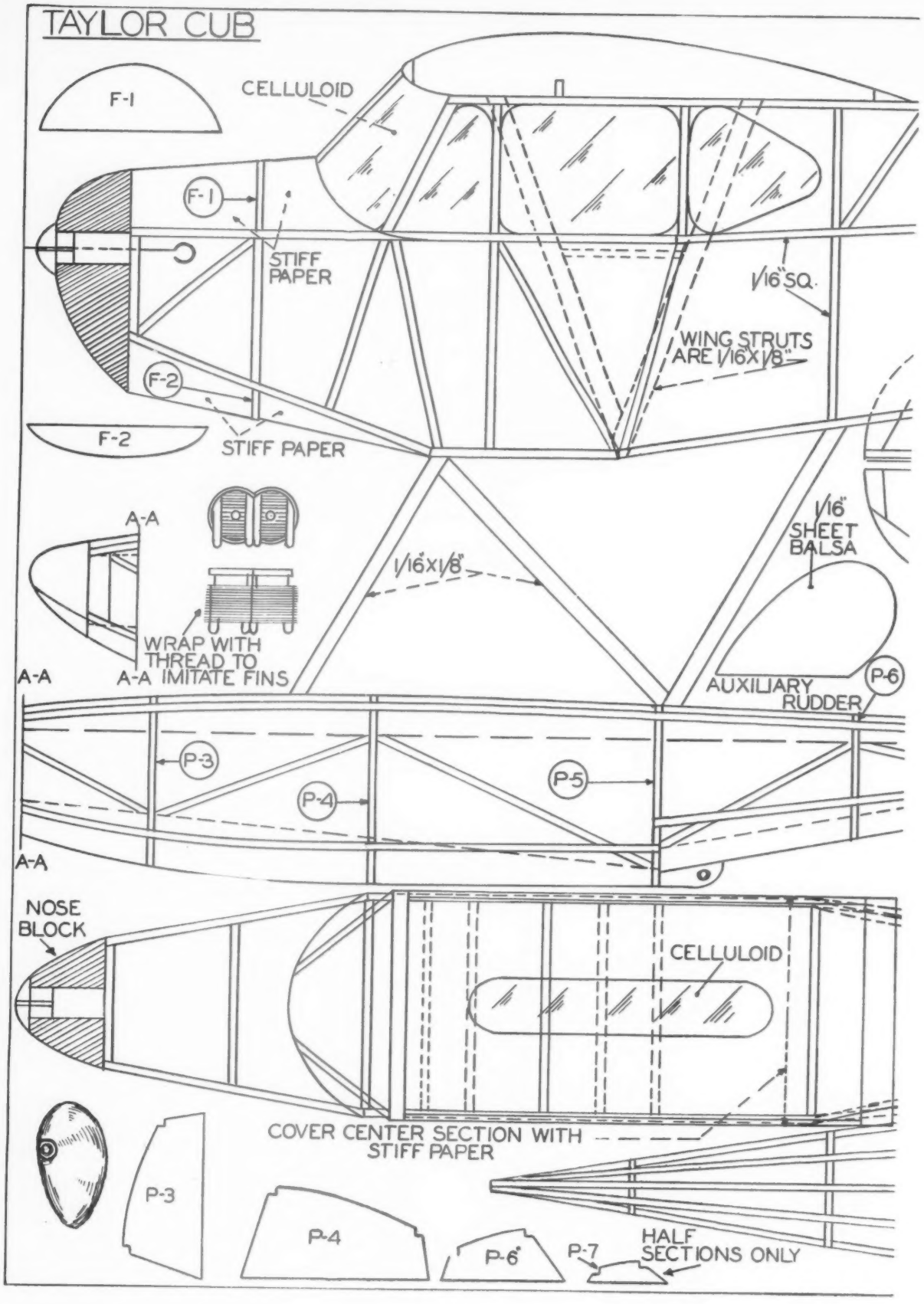
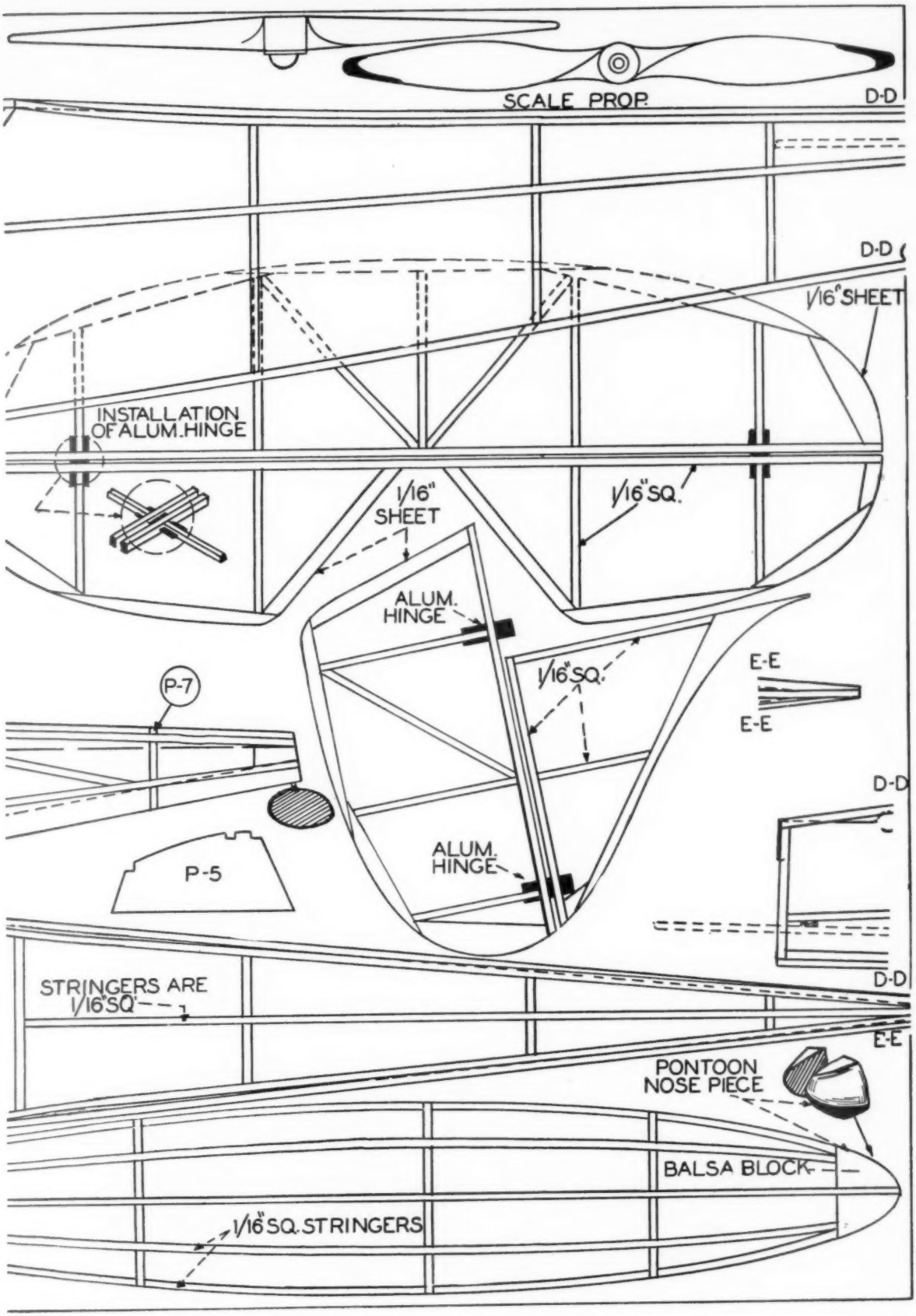
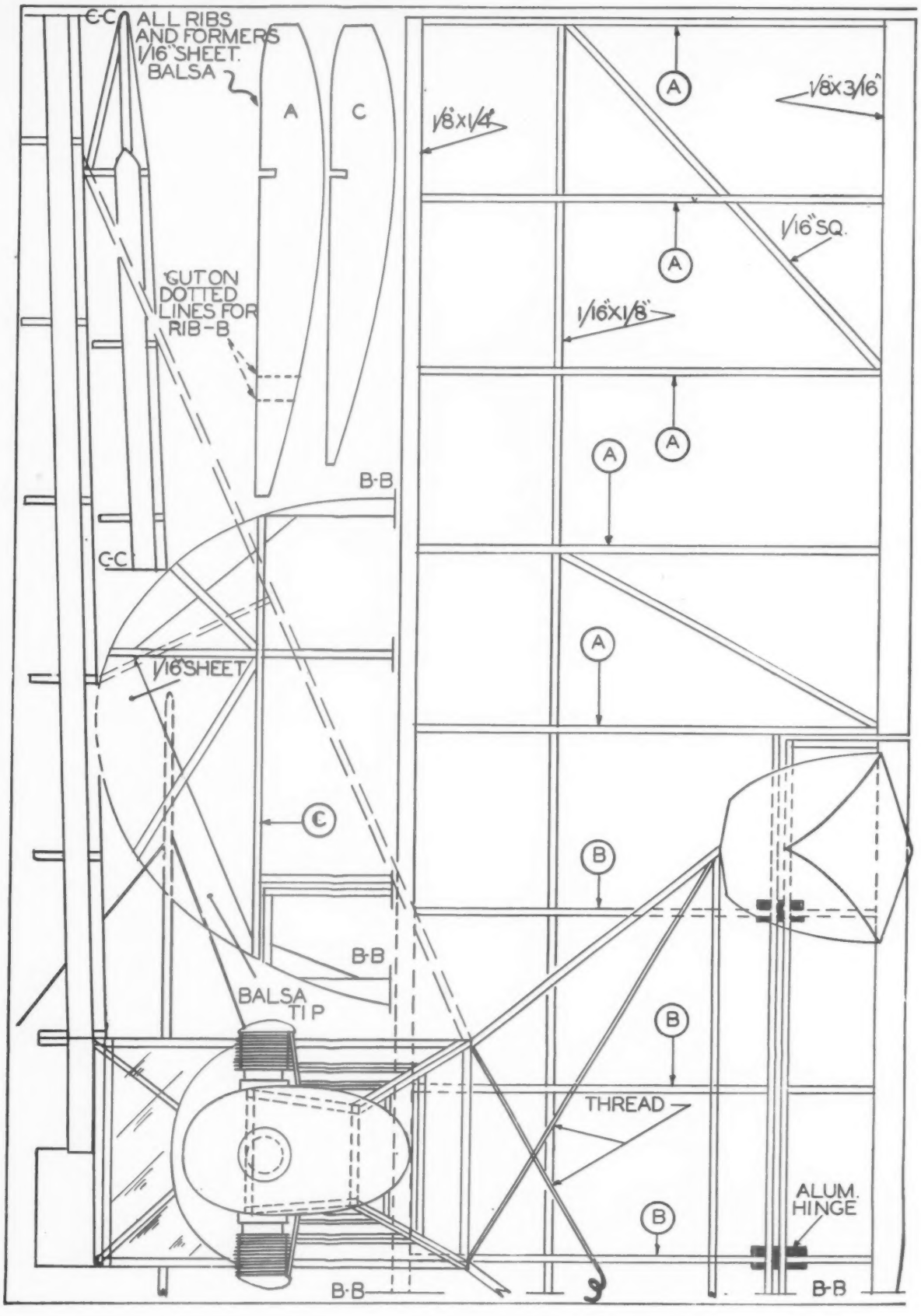

TAYLOR CUB
F-1
CELLULOID
F-1
STIFF PAPER
1/16" SQ.
WING STRUTS ARE 1/16X1/8"
F-2
F-2
STIFF PAPER
A-A
1/16X1/8"
1/16" SHEET BALSA
WRAP WITH THREAD TO IMITATE FINS
A-A
A-A
AUXILIARY RUDDER
P-6
P-3
P-4
P-5
NOSE BLOCK
CELLULOID
COVER CENTER SECTION WITH STIFF PAPER
P-3
P-4
P-6
P-7
HALF SECTIONS ONLY


SCALE PROP.
D-D
D-D
1/16" SHEET
INSTALLATION OF ALUM. HINGE
1/16" SHEET
1/16" SQ.
ALUM. HINGE
1/16" SQ.
E-E
E-E
P-7
D-D
P-5
ALUM. HINGE
STRINGERS ARE 1/16" SQ.
D-D
E-E
PONTOON NOSE PIECE
BALSA BLOCK
1/16" SQ. STRINGERS


C-C
ALL RIBS AND FORMERS 1/16" SHEET BALSA
A
C
1/8"x1/4"
A
1/8"x3/16"
1/16" SQ.
A
CUT ON DOTTED LINES FOR RIB-B
1/16"x1/8"
A
A
B-B
C-C
A
1/16" SHEET
C
B
B-B
BALSA TIP
B
THREAD
ALUM. HINGE
B
B-B
B-B

Full Production at Stearman-Hammond Plant

WITH the completion, in March, of the first 1937 Model "Y" Stearman-Hammond plane, production was immediately started upon the fifteen ships.

The successful tests upon the first ship were not only a tribute to the ability of its designers, but the result as well of excellent plant organization and extremely fine cooperation among the employees, many of whom worked twenty-four hours without rest to enable the first ship to be tested on time.

It is reported by the officials of the company that the first five ships produced will be delivered to the Department of Air Commerce as part of the development work of that Department of the United States Government.

The officials also report a number of these ships sold to private pilots as well as to individual concerns and popular interest in the new development is increasing rapidly.

Demounting Tires

DEVELOPMENT of a new device to save valuable time and effort in dismounting airplane tires is announced by United Air Lines.

The device, which has been perfected by United's station personnel at Seattle, consists of a welded steel automobile rim on top of which are welded two parallel pieces of 1½-inch angle iron. These pieces, in turn, support two pieces of one-inch pipe on which is mounted a 1-ton Black Hawk hydraulic jack. Resistance for the jack is provided in the form of two pieces of 2½-inch pipe welded and bolted to a hangar girder.

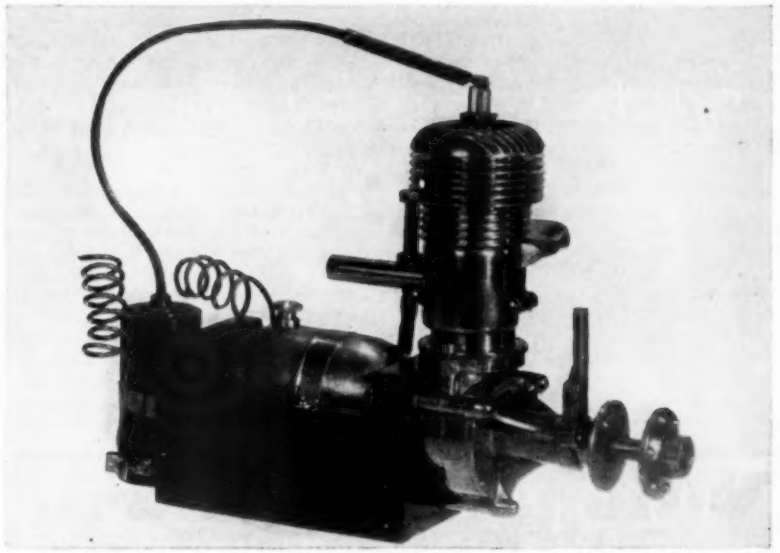
In removing a tire from its wheel, the tire is laid on the floor and deflated. The auto rim then is placed over the inner edge of the tire and the jack is pumped up, thus applying a steady pressure to break the tire loose. This operation is performed on both sides of the tire.

To facilitate removal of the tire from the wheel after it has been loosened by this method, the United station has built a wheel vice consisting of a 2½-inch piece of pipe with a fork to hold the wheel from turning. Mounted on the pipe are two Timken roller bearings to prevent injury to the wheel during the process of removal.

United's mechanics at Seattle claim they can remove a tire in five minutes with their new device.

Operating the tire demounter.

California Record Holder Perfects New Motor



The complete Ohlsson model gas power plant now in production. Note the cooling fins.

IRWIN OHLSSON, holder of the California State record for power models with a time of 1 hour and 3 minutes, has perfected a new radial mounted motor that is turning in some remarkable flights on the Pacific Coast.

In an Ohlsson designed ship, the new motor placed as one of the winners in the Santa Barbara contest held last July. Some of the advantages of radial mounting are greater strength and adaptability and protection against serious crackups, that are always hazardous to models.

The removable crankcase allows for main bearing replacement. This feature will be appreciated by ship owners who have had to buy entire new motors just because the main bearing has worn out. The crankshaft in one piece has a standard pin taper that takes up the play as the shaft wears from the propeller thrust.

All of the Ohlsson motors are factory assembled and block tested before delivery. Precision finished parts have a tolerance of .0001 and are interchangeable.

One of the new motors was block tested at high speed for fifty hours without appreciable wear. The motor has a variable speed of 500-7500 R.P.M. and develops 1/5 H.P.

It Is Unlawful to Repair Patented Machinery

ACCORDING to the law, you as an owner of any kind of machinery have no legal right to make repairs on the portions of such machinery that are patented.

Perhaps you *have* paid in full for the machinery. Perhaps it *is* legally yours. But that makes no difference in the eyes of the law when it comes to repairing or replacing the *patented* parts.

You may brea' or completely destroy the patented parts if you feel like doing that. Ownership permits destruction, but it does *not* permit *building up* of machine parts that are protected by law.

Patents often apply only to a few specific parts. You may do whatever you wish to the *unpatented* parts, of course. But the patented portions must not be repaired by you or by anybody else without the permission of the patentee.

Anybody furnishing parts for patented portions or repairing those parts who is not licensed by the patentee to do so is subject to damages for infringement.

Boeing Giants for TWA Super-Service

A CONTRACT for the purchase of six new 32-passenger transport airplanes by Transcontinental & Western Air, Inc., has been signed with the Boeing Airplane Company of Seattle, Washington.

The new TWA transports will be powered with four engines and will be the largest airplanes in service in the United States. The gross weight will be 42,000 pounds. Work on the first of the new TWA Super Skyliners has already started. It is planned to place them in service in the Spring of 1938. TWA has taken an option on 17 additional planes of the same type.

Simultaneous with the announcement of the purchase of the new planes, Mr. Frye stated that TWA had ordered 36 additional Wright G-100 heavy duty Cyclone engines to power the ships. Capable of producing 1,205 horsepower, the new Cyclones are the most powerful air-cooled radial engines in the country in production.

XUM

Airy Chat

(*Continued from page* 12)

wings, but we hope that we will see some thin wings in the near future having an L/D of from 36 to 40, which we believe is possible.

Thin wings call for external bracing, in the majority of cases, and this external bracing means additional parasitic resistance, but this is not all of the story. If the drag of the thin wings, added to the resistance of the external bracing, can be brought down to the point where the total is less than the drag of thick cantilever wings, then there will be much in favor of the thin wing sections. We believe that there is an opportunity for improvement at this point and that continued experiments with thin wings will lead us to higher overall efficiencies.

A LONG TIME AGO, the writer ran an article in POPULAR AVIATION to the effect that 500 M.P.H. was impossible with present power-plants, at present altitudes and for long distances. This was 'way back in 1930 and seven years later there is still a good 60 m.p.h. between the present top speed and 500 m.p.h. And an additional 60 m.p.h. tacked on to an end of 440 m.p.h. is a whole lot of speed, calling for a whole lot of additional power.

We were reminded of this article recently by one of our old time readers who had assisted in the argument. His reference to this subject prompted me to once again call attention to the fact that I did not limit all speeds to 500 m.p.h., but only to this speed using the present type of equipment, at the usual altitudes and for distances exceeding 100 miles in length. Short hops, with a complete renewal of the power-plants at the end of each hop, do not come under the provisions attached to my article. The whole purpose of the article was to point out the limitations of present equipment rather than to place an absolute limit on speed.

* * *

THAT article certainly brought a mess of protesting letters from our readers who apparently did not understand the true purpose of the article or else did not take the trouble to read it carefully. As I attempted to demonstrate, the heat produced in the jacket water of the present type of engine was so great that it would be impossible to radiate it to the surrounding air by means of the commonly accepted type of radiator. And, this heat disposal problem finally did prove to be the limiting problem in the Super Marine and Macchi ships that topped 400 m.p.h.

* * *

IF WE get a few more, just a few more, entries in our celebrated series of "Who invented the airplane," we'll have enough material to fill a nice large book. You will probably remember that we ran stories on Whitehead, Montgomery, Jannus, Hepburn, etc., in past issues and now we have a new entrant in the sweepstakes who has just made his first bow to the aviation public. And then there were those two brother hermits, way out west, who took a vow not to cut their whiskers until they flew their ship! We get a lot of kick out of this business and hope that time will deal leniently with the rest of them whether entered in our sweepstakes or not.

* * *

So long. J. B. R.

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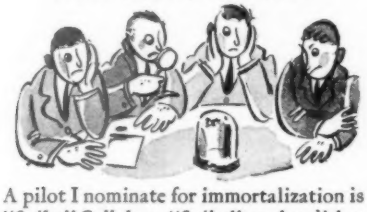
MAJOR AL WILLIAMS, alias "Tattered Wing-Tips," *Mgr., Aviation Dept.*, Gulf Aviation Products, Gulf Building, Pittsburgh, Pa.

HOW DOES A FLY FLY?



A pilot I nominate for immortalization is "Spike" Callahan. "Spike" washes dishes for a living and, in his spare time, flies. He owns a two-cylinder Cycloplane.

"Spike" attends every meeting of the local pilots association. On occasion, at meetings, he has been known to take a swig from the bottle of white port he carries.

One evening during a lull in the meeting, "Spike", who had been quietly gazing upward, spoke out. "Gents", he drawled, "does a fly half-roll or half-loop when he lands on the ceiling?"

At first, all "Spike" got was a laugh. Then the fellows became interested. By the great slipstream, which way did a fly land?

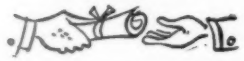
For weeks pilots chased flies. Arguments raged. Two guys darn near came to blows. Finally our president appointed a bug-committee to solve the question.

Their report, the final authoritative word on the subject, is this: A fly lands on the ceiling at the top of a loop. And to take off again he just falls away head-first in a dive which completes the loop.

Now, ain't that sumpin'?

—Cecil Meadows, Bakersfield, California

A FINE RECORD



Gulf extends its sincere congratulations to Eastern Air Lines and to Pennsylvania Central Airlines, both recently awarded safety prizes in airline operation by the National Safety Council.

It is a source of pleasure to us that these two companies use Gulf Products in their planes — Pennsylvania Central using Gulf Aviation Gas, and Eastern using Gulf Aviation Gas and Gulf Airline Oil exclusively.

BIG, BAD STOWAWAY

Not so long ago, a charming young transport pilot (female) got the scare of her life.

As she was all set to take off, a stowaway peered at her from beneath a seat. She screamed, then scrammed—forgetting, in her fright, to shut off the engine.

The ship crashed. The stowaway was killed. But nobody troubled to attend his funeral, for the poor thing was only a mouse.

—A. L. G., Nashville, Michigan

OF ALL THE NERVE!

A lady called the Meteorological Department at Mitchell Field, saying:

"Will you please give me the ceiling and visibility?"

"Where?"

"Just locally."

"Ceiling 1500 feet."

"What is the dew point?"

"Sixty-five."

"What is the temperature?"

"Seventy."

"Will you please give me the weather forecast for this afternoon?"

"Cloudy. Overcast. No change in temperature. By the way, lady, where are you going to fly?"

"Oh, I'm not going to fly. I just wanted to know whether to serve tea in the dining room or on the terrace."

—Rudolph Smutny

WHOPPER OUT-WHOPPERED

Remember that cow H. R. wrote about in the March "Perch"? The one that drank Gulf Aviation Gas—and gave off milk that was plain dynamite.

I want to warn the bozo (H. R., not the bossy). For we had a cow what did the same thing.

Her milk tasted awful. But being on a railroad construction job, I decided we might get some good out of the stuff. So we put some of it in the boiler of a little switch engine we had.

The switch engine ran swell. Oh, she was the best little switch engine you ever saw. But . . .

When the whistle cord was pulled the engine mooed. When the engine mooed an amorous bull jumped a fence nearby. When the bull met the switch engine he was knocked galley-west.

The bull's owner threatened to sue. We calmed the owner by giving him our cow in exchange, our wonderful cow that gave off high-test gas.

Now the farmer's madder than ever. He bred the cow. The calf was born with no tail but a complete empennage, including vertical fin and adjustable stabilizer. And just as he figured to make his fortune out of the darn calf, the little ingrate flew away and has never been heard of again.

—Charles L. Funnell, Yonkers, New York

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Do You Know...

. . THAT May 20-21, 1937, is the 10th Anniversary of Colonel Charles A. Lindbergh's non-stop, solo flight from New York to Paris.

. . THAT a Wright Whirlwind 220 H.P. engine powered the Ryan Monoplane in which he made this famous flight.

. . THAT Colonel Lindbergh's historic Whirlwind-powered "Spirit of St. Louis" is now permanently exhibited in the Smithsonian Institute at Washington, D. C.

. . THAT during 1931 Colonel and Mrs. Charles A. Lindbergh made a flight to the Orient—from Washington, D. C., to Tokyo, Japan—in a Cyclone-powered Lockheed Sirius Monoplane equipped with floats.

. . THAT two years later, during 1933, Colonel and Mrs. Lindbergh made a survey flight of the North Atlantic air routes for Pan American Airways in their Cyclone-powered Lockheed Sirius Monoplane. On this flight the Lindberghs visited 31 countries and colonies including Canada, Iceland, Greenland, Europe, Africa, South America and the West Indies—spanning both the North and South Atlantic Ocean before returning to New York City—covering a total of 30,000 miles!

. . THAT 1937 is also the 10th Anniversary of the Wright Cyclone, the first production models of which were manufactured in 1927 for the United States Government.

. . THAT during the past 10 years the horsepower of the Cyclone has been increased from 400 H.P. to over 1100 H.P. During this period the Cyclone has been standard power equipment for many types of military and naval planes built for the U. S. Government.

. . THAT Wright Cyclones power many of the latest types of U. S. Army and U. S. Navy aircraft as well as all of the high-speed, luxurious Douglas skyliners now in service on American Airlines, Eastern Air Lines, Transcontinental & Western Air, Pan American Airways System and many other leading airlines throughout the world.

"Fly with Wright
the World Over"

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Swanee Taylor

(*Continued from page* 30)

the peppery, sore-headed brand frequently found among the garment workers over on the East Side.

I wonder if the C.I.O. can't do something about it! (John Lewis, please note.)

Lotta Scud

Attention School principals: Before you make plans for the next semester look over "Aviation in the Public Schools," by Robt. W. Hambrook. Send 15c to J. C. Wright, Asst. Comm. for Vocational Education, Dept. of The Interior, Washington, D. C. They've done an excellent job . . . Everybody is wishing that Vincent Bendix would hurry up and turn out a 70-80 h.p. engine for private flying. He has a good start with his outboard motors development, and 'twould be the biggest contribution to flying since the Wrights . . . Eyebrows zoomed plenty when Louise Thaden failed to mention her co-pilot once at the Advertising Club luncheon in New York. All the ship did was carry them there, while everybody knows that Blanche Noyes did her share. Say it was an oversight, Louise . . . I'm dying to ride a sleeper plane and have the hostess come fasten my belt after I'm tucked in. Here at last is worthwhile hostess service! . . . As we go to press my review copy of the Aircraft Year Book for 1937 hasn't arrived. And am I sore at Howard Mingos! (Goody, goody, you guys have to pay five bucks for this wealth of information) . . . The Fordon-Brown troupe of aerial charioteers are clicking so well on the road that the N.A.A., sees the light. Result, the Cleveland Air Races management will be very docile little lads from now on . . . Sign of trend: Bill Young, of Taylorcraft has hired Stanley I. Vaughn away from Curtiss to be factory manager out in Alliance, Oh hy yo. And all the light plane builders are truly sorry about the fire up at the Taylor Cub factory. All hands pulling together like good guys in lending a stricken competitor a helping hand . . . Take back what I said about air hostesses above. Just learned that one Line is running in Indian gals. (Squaws for Squabs) . . . Have the congressmen from Tenna., Miss., and Ark., already forgotten about Vernon Omlie and how he used to save hundreds of lives every Spring when Ole Man Ribber ran wild? If gallantry still lives in the South, Captain Vernon Omlie will receive, post-humously, a Distinguished Flying Cross for some of the most heroic flying in the history of man. (Memphis papers please copy.)

END

U. S. Planes

(*Continued from page* 16)

huge XPBY-1 (Consolidated Patrol-Bomber) and the gargantuan XPBD-1.

Will the single-purpose airplane disappear? This is the question the Naval engineers, the designers, and manufacturers are discussing. Will the day of the highly specialized ship, built and flown under one set of tactical specifications become a day of the past?

With the lone exception of the single-seater fighter, this day HAS passed. There are no more single-designation ships to be found in the Naval Air Service other than these fighters. Today, the Grumman F3F-1, is the speediest fighting ship in the Naval Air Service.

The Douglas XTBD-1 with its three members of the crew, its huge load of equipment, its deadly complement of bombs, and its giant torpedo, a wicked messenger of destruction screams through the air at 236 miles per hour, faster than the fighter!

These facts point in but one direction; the day of the single purpose ship HAS passed!

END

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Wildman

(*Continued from page 26*)

thinking how wonderful it was and, you might say, wondering how soon they'd have to hire aerial traffic cops.

"While at home they were still trying to bludgeon orders out of our government, and being required to do almost impossible things with the ships before they could be sold, I delivered 48 planes to the Russian government.

"I sold to anyone and everyone although chiefly, of course, to governments. I suppose everybody had a war in mind, because I could see that the military advantages of an airplane were considered as very important factors in choosing ships. But we built good ones and it wasn't hard to sell 'em!"

Although Wildman stopped flying just a few years ago, and had flown in the most hectic days of aviation, he says his most thrilling experience came in 1918, when he was instructing army officers at March field, near Riverside, Calif.

"I had a class in advanced aerobatics, although we didn't have any such fancy name for it then," Wildman told us. "Every morning from 8 o'clock until 11:30 we used to do all kinds of things in our 'Jennies,' although you must understand that we didn't do any outside loops and missed a lot the boys today think nothing of.

"I got a ship for test flying, and headed her out toward Mounty Baldy, circling around until I got up to 10,000 feet. Then I did a power loop and a couple of Immelmanns. I lost a thousand feet or so doing those, and then cut the power and did a slow loop.

"You could have knocked me down with a feather when that crate refused to come out of the loop as we got on top. We just stuck there, me with my head pointing to the ground and wondering what it was all about. I kicked everything in sight, thinking something had stuck, but nothing happened and we seemed to be marooned—me and that damned Jenny. Of course we soon began to fall, and I figured she'd pull out of it as any self-respecting airplane, even a Jenny, ought to do. Only we didn't—we just kept dropping down, head and tail.

"We fell 6,000 feet. I know, because I watched the instrument board, having very little else to do. I had no chute, so of course I couldn't jump. I simply didn't know what to do. I was so amazed I didn't have time to be scared. Then, all of a sudden (and I still don't know exactly how she happened to do it) she spun around and I was safe. I brought her down in a hurry. Those who saw it thought it was funny as hell, but it was a long time before I could see anything humorous in the situation. I do think the reason we pulled out of it was because a wind current from another direction hit us."

When this incident happened, Wildman was in the government service. Prior to that he had been in charge of the Curtiss flying school at San Diego, Calif., and had just delivered the first naval flying boat by piloting it from the factory to the Norfolk navy yard.

He then became a civilian flying instructor for the government, remaining in that capacity for some time after the World War had ended. He doesn't know exactly how many men he trained, but about 1,600 men a year came through his hands during the war period. Before that, however, the government had 77 Junior Military Aviators as the war broke out in 1917, and Doc trained the First Squadron, which went to Mexico with John J. Pershing in 1916, and was under the command of Lieut. Benjamin D. Foulois, now retired as a general after an illustrious period as chief of the army air corps.

Wildman had some since-famous aviators as his students. John P. Mitchell, well known former New York mayor, was one of them. Bill Thaw, pilot with Colonel Eddie Rickenbacker in the famous Lafayette Escadrille during the World War, and Major E. L. Hoffman, well-known army parachute expert, are two others.

He helped Colonel Lindbergh test-fly the Spirit of St. Louis when he was stationed at Rockwell field, San Diego.

Wildman has bright blue eyes, which can be cold, but more often than not twinkle or, as he talks of old times, soften with nostalgia. When he looks out of his office windows, and watches the army's latest experimental bomber drift in to a landing on Wright field's green carpet, you can see the longing in his eyes, but the last time he flew was in 1931, and he has given it up for good. He figures that being a grandfather, as of St. Valentine's day, 1935, gives him too many responsibilities, and that, besides, he's done his share.

END

Curtiss

HAWK 75

PURSUIT AIRPLANE

The Curtiss Hawk 75, powered by the 1000 H.P. Wright Cyclone, is a development of the Pursuit Airplanes recently constructed by Curtiss for the U. S. Army Air Corps. It is an all-metal, low-wing cantilever monoplane with fixed landing gear and tail wheel. The Hawk 75 is one of the world's most formidable pursuit airplanes for defense purposes.

★

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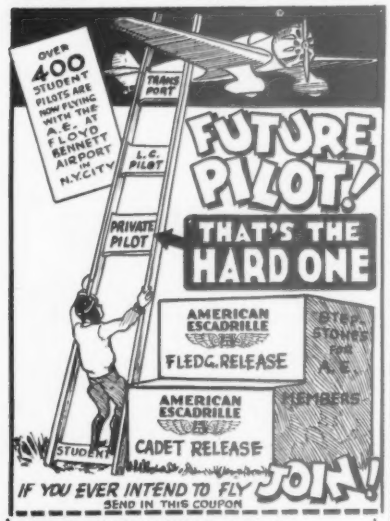

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Major Spatz

(*Continued from page* 18)

its wings. The bulk of the American Army was being moved in to dislodge the Boche from his Argonne stronghold. And the U. S. Air Service had a mad major at the Front, a major with a German name, one who had access to orders for the greatest offensive of the war—and that major was leading a flight, even flying alone into Hunland! His reports showed plainly that he had no intention of fighting in the air. He must be carrying confidential information to the enemy.

It is not a part of official records, but the French military police were instructed to bring Spatz in for questioning.

Then, in the early morning of the first day of the Argonne-Meuse offensive, which was the beginning of the end for Germany, the thing the French were certain would occur, transpired. Spatz was reported missing—last seen flying into Hunland.

Flying low over Flabse, early in the morning of Sept. 26th, the major's flight ran into a flight of 7 Fokker D-8's, the deadliest fighters the Boche ever put on the Front. Spatz waggled the wingtip of his Spad, signaling every man for himself. Soon the 5 American pilots were locked in a deadly dog-fight with the 7 D-8's.

Spatz gunned his motor into a dive that carried him within 10 meters of a Hun single-seater. Spatz parried machine gun bursts with the Boche; poured a total of 75 rounds into the Fokker, felt his own ship shudder under the impact of countless Spandau slugs.

Snapping his head around the American saw another Fokker on his tail. Yanking the control column against his safety belt Spatz zoomed up to 4,200 meters. No sooner had he redressed his ship than he was going down in a screaming dive on the pursuing Fokker.

The Hun fought against a superior fighter. Spatz's deadly fire sent the Hun down out of control. Returning to 4,000 meters the major got on the tail of a third Fokker. Following it down to 3,500 meters he sent withering sprays of lead into the ship. The Boche never knew what killed him.

Spatz snapped out of a roll, saw a wing sag. Fabric hung in tattered streamers from the wing, fuselage and tail assembly of his fighting ship.

Its pilot had flown through a hail of lead without a scratch, but not the Spad. It was riddled and battle-torn beyond repair. Struts were lead-chewed, wires dangled in the air. It would be a miracle if it could ever regain the American lines.

Filled with the zest of desperate battle, Spatz was recklessly unmindful that he flew a weakened, faltering plane. Instead of attempting to nurse it back home, he spiralled, looking for more enemy ships. But 4 of the 7 Boche had been shot down. The others had fled with the Americans on their tails.

Then a time-worn climax of fiction stories actually happened to the major. His motor began sputtering. He switched on the reserve petcock. Enough gas for 10 minutes more flying. Spatz fully realized that he was too far behind the enemy lines to ever get back to 13's drome. He climbed for altitude, headed south for the American lines. The gas supply ran out. A long glide only carried the major to a dead-stick crash in a shell hole of No Man's Land. The ship was so badly shot to pieces that it literally flew apart under the force of the impact.

Spatz, fortunately unhurt, crawled to the American lines, commandeered a military police car. He identified himself, ordered to be driven to 13's drome.

But you will recall that I related that all points at the Front were preferably reached via Paris. The major found him-

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self in Paris. At Aviation Headquarters he experienced considerable ground-stafing from the Brass Hats.

Spatz's laconic explanation that he had merely taken time off enroute to Paris to get his bag of Huns wasn't sufficient to explain away a long list of military offenses that had disrupted the hallowed system of military discipline, all of which had given the French high command a terrifying spy scare. Spatz's future looked as black as the interior of a military dungeon.

Squadron 13 came quickly to his aid. Its staunch membefs related accounts of the major's heroism, exemplar daring in the face of enemy fire; avowed, to a man, that he had been an inspiration not only to the squadron but the entire 2nd Pursuit Group. Spatz of Issoudon had taught them to be pilots; Spatz of the 13th had shown them how to really fight!

The situation was awkward, as always the prospect of facing a firing squad is to the hapless warrior who fights more with his heart for his country than with his head. Then dawned the day when Major Spatz was marched out on to a military field of honor. Rifles slapped in response to commands. Spatz stepped forward, head high, shoulders squared. Following is the "sentence for treason" read aloud by a high ranking American officer so all present might hear:

"For extraordinary heroism in action on September 26, 1918. Although he had received orders to go to the United States, he begged for and received permission to serve with a pursuit squadron at the front. Subordinating himself to men of lower rank, he was attached to a squadron as a pilot, and saw conditions and arduous service through the offensive. As a result of his effective work he was promoted to the position of flight commander. Knowing that another attack was to take place in the vicinity of Verdun, he remained on duty in order to take part. On the day of the attack west of the Meuse, while with his patrol over enemy lines, a number of enemy aircraft were encountered. In the combat that followed he succeeded in bringing down two enemy planes. In his ardor and enthusiasm he became separated from his patrol while following another enemy far beyond the lines. His gasoline giving out, he was forced to land and managed to land within friendly territory. Through these acts he became an inspiration and example to all men with whom he was associated."

The officer stepped forward, pinned a hero's reward upon the breast of Major Carl Spatz—the Distinguished Service Cross—and spoke, under his breath: "What America needs is more mad majors!"

EDITOR'S NOTE. Carl B. Ogilvie, the author, carefully investigates the authenticity of each incident quoted in his articles and therefore, we can assure our readers that Mr. Ogilvie's stories are true stories of the World War days. As we remarked, truth is stranger than fiction.

END

Leslie Long

(*Continued from page* 34)

excellent aviation law and what it is doing for amateur flying here, how it is administered and who does it and our plans for the future. The coming article should point the way for any state to have the freedom we have.

The photos and drawings, together with the general dimensions given below should be enough for any enthusiast to go ahead with building one of these jobs if interested enough, but if anyone needs further help I will be glad to do what I can. My address is the same as always, just Cornelius, Oregon. And don't forget to enclose a stamp because the post office insists on charging me three cents each for them.

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Weather

(*Continued from page 36*)

the teletype circuits and are used by the forecasters and airlines to assist in determining the weather and also the performance of aircraft. Their use requires special charts and a great deal of skill. Still other data is sent but is not of sufficient importance to mention here.

The use to which all this available data can be put depends on the knowledge of meteorology that the pilot has. The first step is to consult the weather sequences for the trip to be flown. Under ordinary conditions and for very short hops, the weather at the time one arrives at one's destination is usually not significantly different from what it was at the time of takeoff. For flights of longer duration, this is not the case. For these longer flights, a careful study of the latest few sequences should be made, especially if there is a chance of conditions being such as to cause the cancellation of the flight.

From these past sequences one can determine the trend of the weather at the various points along the route. Suppose, for example, that at our destination the ceiling for the last three successive hours has been reported as 1800 feet, 2000 feet and 2500 feet successively before our takeoff. We might reasonably expect a ceiling of better than 3500 feet at the time of our arrival three hours later, providing unforeseen factors did not complicate the weather.

These unforeseen factors are sometimes of considerable importance. Sometimes they may be caught by a careful analysis of the past weather sequences not only along our route but also along other neighboring routes either parallel or intersecting.

For example, if the route to be flown runs east and west, it may be crossed by weather that is moving in from the north. This accounts for the apparently unexplained and sudden changes in the weather that are often met with. However, there are many times when the changes in the weather are sudden, no matter how they approach.

In order to get a complete picture of the weather processes that are taking place and can be expected in the next several hours, one must consult a "weather map." This is a blank map on which has been entered the observational data from stations not only along the airways, but also from intermediate stations. It gives a comprehensive picture of the situation at the time at which the observations were made, especially since the stations appear in the proper geographical relation.

The proper use of the weather map requires some skill and training. Although it is a necessary aid to the airman, one should not rely on one's own predictions based thereon unless one has had considerable experience.

In order that the results of the many years of necessary experience in the study of the weather can be available to the men who fly, the Weather Bureau maintains a special group of forecasters whose task it is to prepare forecasts for the use of aviators. The importance of these forecasts in the preparation of a flight cannot be overemphasized.

Moreover, it is recommended that in preparing for a flight, the pilot should not only read over the forecast prepared by the Weather Bureau, but should also consult the weather map and the teletype sequences to insure complete understanding of all the implications on it. The forecasting of weather is not a simple job, especially since the forecast must be written in the fewest number of words and read by so many people with such wide differences in experience both in flying and in the study of weather.

Even to give an idea of the methods used in the preparation of these forecasts would require more space than is available in this article.

To summarize: I have attempted to point out where one can obtain complete weather information for a flight and what kinds of material are available for those who can use them. Second, the importance of understanding *exactly* what is meant by the weather observations; and, third, the first essentials in the way that this material should be used in planning a flight. It must be understood that these are only the first essentials; i. e., this is where one should start. For a complete understanding of the science of the weather, one must go much farther.

END

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Hawaii

(*Continued from page 42*)

the U. S. Customs, Public Health, and Immigration Services. On the main floor is a reception lobby and a wide Lanai porch furnished with tropical bamboo and reed furniture.

Located on the outskirts of Honolulu, and right next to the boundaries of Hickham Field, which will be the largest airport in the world when completed, lies Honolulu's famous John Rodgers Airport. This is a very fine field and can compare favorably with any field in the United States. It has one runway of 2,200 feet and another of 1,700 feet. Within a very short time though, these runways will be enlarged to approximately 3,000 feet.

On the east side of the field lies Pearl Harbor, making it possible for seaplanes to use this field also. One unusual thing about this field is the fact that the runways and the base of the field are of coral formation making a very smooth runway and during the rainy season it absorbs the water, thereby leaving a dry field without the usual mud and pools of water which form on most fields.

At the present time the W. P. A. has appropriated about $1,500,000 for more extensive work on this field. The plan is to fill in about 800 acres of land, which at the present time is a mud flat, and to use this extra space for longer runways and the new Pan American Airways Base, which will be moved to this field as soon as this project is completed.

Mr. Williams, the airport manager, has reported that there has been a big increase in business during the past year. There are twenty-two private and commercial aircraft operating off this field at the present time, and the two flying schools at the field report that they have had a big increase in both passenger and student business.

The Andrews Flying Service which is operating seven planes, including two Taylor Cubs, has 75 students taking instruction in both the primary flying and advanced flying courses. They also have a special course in Blind Flying and a course in Radio Beam using a specially built Radio Beam set installed in a J-5 Stearman for this type of instruction.

During the past year these two Taylor Cubs have each been averaging over 100 hours in the air per month. This shows a remarkable increase in student instruction over the past year. The Great Lakes Trainer which the Andrews Flying Service is also operating has been averaging around 75 hours per month during the past year.

Considering that the first airplane was brought to the Hawaiian Islands less than ten years ago, this field has set a very fine record, not only in commercial flying, but in private flying and the absence of accidents which has characterized this field—show a remarkable degree of safety and close observance of the Air Traffic Rules which many airports, I could name, should copy much more closely than they are now doing.

Many of you are no doubt wondering as to the expenses of upkeep and flying here in Hawaii—situated as it is, over 2,000 miles from the mainland of the United States. Gasoline, oils, and spare parts are all shipped to Hawaii, but considering the difficulty in obtaining these commodities, the prices are very reasonable indeed, and it costs but little more to fly here than it does on the mainland.

Many of you no doubt remember some of the pioneer flights to Hawaii, of the many hardships and dangers the crews of these planes had to undergo, not only in the actual flight itself, which was one of the most dangerous flights there was to make, but in the preparation and tests there were to make before they could start on this hazardous flight.

The first attempt was made in 1928 by the U. S. Navy, who prepared three PN-9 seaplanes for the flight across the Pacific. They were put in command of Lieutenant-Commander Rodgers, who was at that time Captain of the U. S. S. Wright and in charge of all aircraft aboard.

After many delays and disappointments in trying to prepare the planes for the flight, the date of the take-off was set for July 28. At the last moment they found that one of the planes, in command of Lieutenant Commander Strong, would be unable to take off on schedule, so it was decided that the two remaining planes were to go on by themselves. To add to their troubles bad weather set in and so delayed the flight again until August 31.

And finally on the morning of the 31st of August the planes got under way on the first attempt to span the Pacific by air. To quote Commander Rodgers, as he reported the take off after the flight was over, "About ten-thirty," says Commander Rodgers, "we got into the planes and were towed out to the starting point. From the tender a hot dinner was served to us, which put us in fine fettle.

"Admiral Moffet and Colonel Lahm arrived in a motor-boat to bid us farewell, and Admiral McDonald, who was to go on duty in the Hawaiian Islands. A few minutes after the appointed time both planes got under way. We passed out of the Golden Gate into the haze of the great Pacific, and no commanders ever left port by ship with stronger belief in a successful voyage than did Commander Snody and I. Yet, in his sober moments, every aviator knew full well his great peril.

You all know the startling results of this flight, and how near it came to ending in tragedy for all concerned. How at the time that they were about 450 miles off the coast of Hawaii, they were forced down for lack of fuel, and how by rigging sails out of the fabric off of the wings they sailed the last stretch into the Hawaiian Islands, taking nine days to make the trip from San Francisco to the Island of Kauai.

Thus ended the first attempt to span the Pacific by air, making a flight of 1,870 miles and sailing the remaining 450 miles.

END

Luscombe Plane

(*Continued from page 30*)

overhaul and was due to go out that afternoon. I decided to stick around and see it leave. I didn't have to wait long.

Soon the pilot appeared and pushed his plane out on the tarmac. After preliminary tests of the controls and motor, he taxied to the far end of the field. He took off coming dead toward me, so it was impossible for me to tell just how quickly it took off, but it took off in a very short space.

As he roared over my head, he pulled the plane up in a very steep climb. For a moment I feared the climb was too steep. The plane banked around and roared across the field down wind and climbed even steeper than before. Pulling out of the climb with a half roll, he circled the field and headed for Newark.

This marvelous performance impressed me even more emphatically that the Luscombe Phantom is a great airplane.

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Thin Air

(*Continued from page 24*)

had already taken all the extra time allowed, an even more serious accident happened. Slim noticed a queer taste in his oxygen. He turned back to look at Red King who was shooting the pictures. Talking was a terrible effort, at that altitude. It wore him out to turn his head, after three hours on the job.

"Taste queer?" Slim yelled at Red.

Red shook his head, "No." Slim knew what he meant. Red was in charge and the ship was in position for the first time in two weeks to fly a strip when the light and weather were right for good pictures. Time was getting so precious they couldn't spare even five minutes unless necessary.

By the time they changed tanks, or investigated this one, they'd lose the time needed to fly the strip. Slim signaled with his red light that the ship was all set for the camera work and in a few minutes Red was clicking them off.

By golly—that oxygen tasted awfully sweet. Slim decided when they'd finished this strip they'd make a shift in tanks even if this wasn't empty. His eyes began to feel heavy—he felt dizzy—with a greenish taste in his mouth. Even stratosphere juice was better than this.

Slim spat the tube out of his mouth and turned by a tremendous effort to look behind him. In the revolving circles which seemed to heave and sway around him, he saw that Red had slumped forward over his camera. Something was certainly hay-wire.

Slim headed for the field, groggy and green-eyed though he was. He was afraid he couldn't get down without a wreck. Everything swayed around him. After they got down into the lower levels he felt a little better, however, and they managed to make the field all in one piece, but two very sick members of the aerial survey crew staggered from that plane.

Red was sick for several hours, but Slim was better in a little while. When the haze lifted somewhat he investigated the contents of that oxygen tank and tested the remaining gas on men in the hangar.

"Ether!" Came the unanimous verdict.

Some mistake in labelling the tank had occurred, or one of the ether tanks had not been completely drained before refilling it with oxygen. Since the tanks were similar to ether tanks filled for hospitals by the same chemical company, this seemed the most logical explanation.

Although this was the smallest of all these pieces of work and this crew was experienced both in mountain flying and camera work at high altitudes, this job and this particular crew got all the rough breaks.

Since these are all unusual accidents, however, the hardships of flying in thin air need not be much more hazardous than in lower altitudes, and certainly there is no necessity of fear of oxygen jag.

END

Canadian Airlines

(*Continued from page 46*)

fires. Ontario therefore became the first state in the world with an air forestry patrol. Pilots associated with that pioneer work, which has continued to this day and is now a mighty force as the Ontario Forestry Branch, are today some of the keymen in the development of Canada's aviation.

It was this same Provincial Air Service that was responsible for undertaking a task which, at the time, to say the least, appeared of little importance. This was the flying of men and equipment into famous Red Lake gold-fields in the fall of 1925, the first time planes were pressed into service to assist the mining industry. The lead given supplied inspiration to a few of the great Canadian fliers and, within a few years, planes were regularly flying men and equipment, machinery and mail into the mining camps of Northern Ontario, Quebec, Manitoba, Saskatchewan, North-West Territories and British Columbia.

In 1927 the late Capt. Fred Stevenson, the first and only Canadian to win the Harmon trophy and whose memory is dedicated by a marble tablet at the hangar of the Winnipeg Flying Club reading "Canada's premier commercial pilot," flew 27 tons of freight into the Sherritt Gordon mine in Northern Manitoba. He flew 13,000 miles in 28 days to complete this movement which was the first freight contract of any account ever attempted by aircraft.

END

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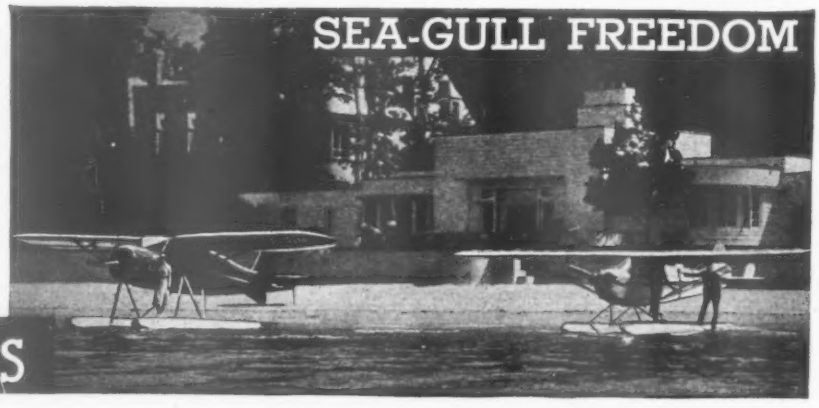

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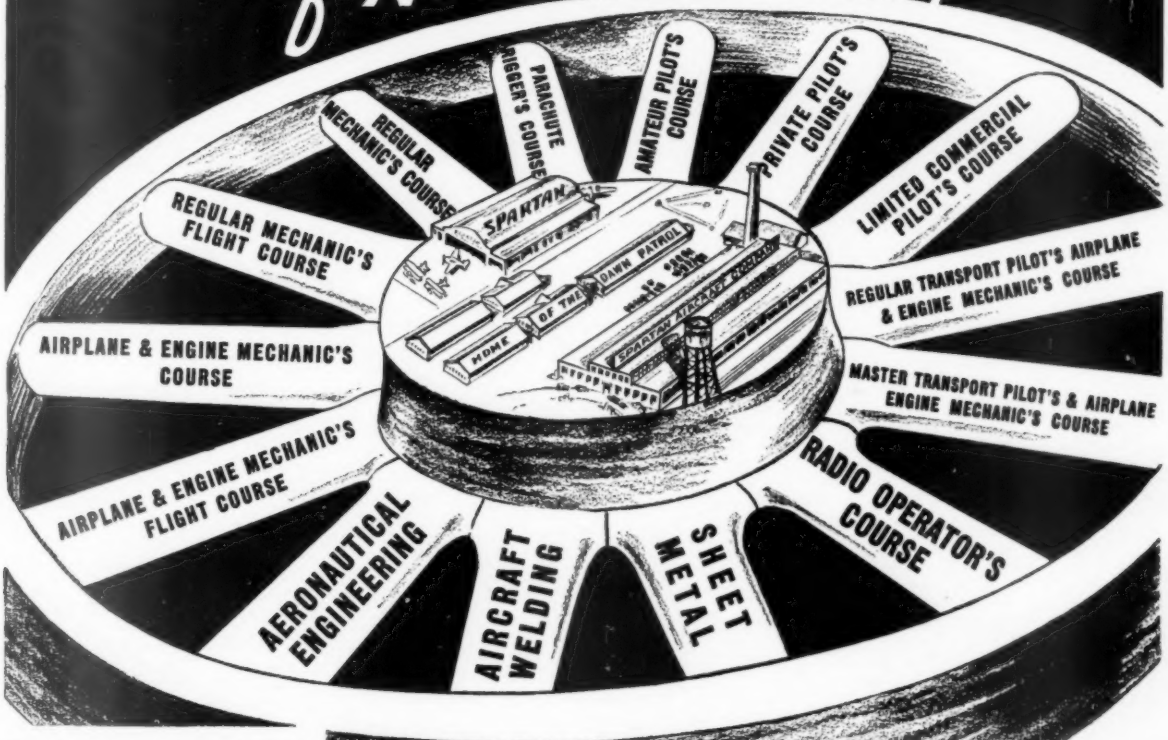

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British Agents: Model Supply Stores
46 Derby Rd., Prestwich, Lancs., England

Women

(*Continued from page* 43)

chops, potato, fresh vegetables, salad and dessert. Most popular desserts are ice cream with cake, Bavarian cream puddings, apple pie and assorted cheese.

Air passengers notice their after-dinner cigarettes last longer at 10,000 feet than on the ground. The slow burning is due to thinner air and altitude also affects the serving of liquids. Thermos bottles have an air valve which allows the air pressure to be discharged before liquids are withdrawn. Bread and rolls dry out readily at high altitude. United packs each roll in a separate glassine bag. Breads which have a high moisture content, such as rye bread, raisin and Boston brown bread, are used extensively, as are Melba toast and crackers.

Food service for New York-California-Pacific Coast planes requires food depots at Newark, Cleveland, Chicago, Omaha, Cheyenne and Salt Lake City, with additional commissaries at Los Angeles, San Francisco, Portland and Seattle. At intermediate stations, such as Cleveland, the caterer has a short-wave receiving set to receive pilots' radio messages on exact arrival times and number of lunches required.

Already, some women passengers have commented that airline meals are the longest in the world, there being approximately 200 miles between soup and nuts. For the Skylounge service, a total of 328 pieces of equipment, such as cups, plates, napkins and containers are used to serve fourteen meals—illustrating the complicated routine practiced to give plane passengers a hot meal of hotel quality. In 1937 more than a million and a quarter passengers will fly on the nation's airlines. A third of these will be women, so is it any wonder that the air lines are anxious to develop this new field and encourage women to take to flying on their travels.

END

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Attack-Bomber

(*Continued from page* 20)

two spars and the main tank is in the fuselage. The oil tanks are situated outside the motors and form the leading edges of the wing. They are equipped with wing coolers.

Because of the importance of the pilot's armament, it is better dealt with alone. Two fixed Madsen 7.9 mm. guns are fixed in the nose and these are provided with 1100 rounds and below them a little to the rear are two Madsen 23 mm. cannons with a total of 200 shells. The shells are carried in belts which aids the rapidity of fire. If after 10 seconds they have not registered they explode themselves so that they will not cause damage by descending on friendly territory. To open fire the pilot just depresses a lever and after firing the guns are loaded by a combined pneumatic and hydraulic system. The four guns may be fired at once or separately by means of selective levers.

Span	54'1"
Length	33'9"
Height	11'1"
Wing area	384 sq. ft.

WEIGHTS

Empty	6610 lbs.
Useful load	3090 lbs.
Gross weight	9700 lbs.

CEILING

Absolute	30,500 ft.
Service	29,500 ft.
Absolute (one engine)	16,730 ft.

PERFORMANCE

Max. 11,480 ft.	280 m.p.h.
Max. 13,200 ft.	277 m.p.h.
Max. 19,700 ft.	260 m.p.h.
Max. 6,600 ft.	259 m.p.h.
Max. sea level	234 m.p.h.
Cruising 11,480 ft. (50%)	217 m.p.h.

With a Bristol Mercury VII:

CEILING

Absolute	31,500 ft.
Service	30,000 ft.
Absolute (one engine)	17,700 ft.

PERFORMANCE

Max. 14,500 ft.	292 m.p.h.
Cruising (2200 r.p.m)	224 m.p.h.

END

Douglas Plane

(*Continued from page* 16)

In making the announcement of the new sky liner, Donald Douglas, president of the Douglas Aircraft Corp., commented:

"To us the most significant fact about the creation of the new DC-4 is the brain power that went into its making. The engineering staffs of the five major airlines cooperated on the project with the determination to provide in one great ship the peculiar needs of each carrier.

"We believe that never before in the history of peace time aviation have so many great engineering minds been brought to bear on a single production problem. Present indications are that the plane itself will be as sensational as the manner in which it has been produced."

END

XUM

THE NEW SENSATIONAL SELLEY-TEX **MOTH**

ALL FINISHED MOLDED ASSEMBLY KIT

ONE HOUR BUILDING TIME TO ASSEMBLE THIS SNAPPY LOOKING MODEL

GUARANTEED TO FLY 200 FEET

22" Wing Span

1.50 *15c Postage*

This trim, graceful new **SELLEY-TEX** sensation is a modified design of the famous English "**DeHAVILLAND-MOTH**" and is the most beautiful flying model ever produced. **FOR THE FIRST TIME** since the inception of MODEL Building, **SELLEY** has accomplished that which has been the goal of all model manufacturers. **HERE AT LAST**—is a super quality model that is scientifically designed and aerodynamically perfect that will give amazingly long flights, either from the hand or off the ground. The method of construction and new uses of materials are entirely novel and new in model airplane building. All parts of the **Moth** are beautifully moulded in the form of light hollow shells, perfectly shaped and fully detailed. The fuselage shells are firmly fused together forming a perfect, crashproof fuselage. All wing surfaces are moulded in the correct wing curves and are completely finished. The moulded hollow streamline struts are remarkably strong when cemented together. The "**MOTH**," when assembled, is practically crashproof and will stand up under the most severe flying punishment. Attractively and completely finished in a combination of three beautiful colors. Be the first to FLY the **MOTH** in your neighborhood. Ask your dealer—if he can't supply you send direct **$1.50** plus 15c postage.

BEWARE OF STICK MODEL KITS SOLD AT LOW PRICES. SELLEY-TEX KITS ARE GUARANTEED. BUILD SELLEY-TEX AND YOU WILL OWN A MODEL YOU WILL BE PROUD TO FLY.

CAPT. MOLLISON'S SELLEY-TEX BELLANCA RACER

20" WING SPAN

1.00 *15c Postage*

A Guaranteed Kit

THE LEADING STORES CARRY SELLEY-TEX "There's a reason."

EVERY SELLEY-TEX KIT CONTAINS:

The necessary moulded fuselage sides, cowl, pants, bombs, motor, etc., sawcut propeller, scale propeller parts, formed wire hooks, scaled wheels, brass bushings, printed out ribs on balsa, turned wood parts, tail wheel fork fittings, wire, para rubber motor, colored paper, authentic markings, colored insignia, cement, colored dopes and easy to understand plans, all are packed in a beautiful, sturdy box.

SELLEY-TEX REARWIN SPORTSTER

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16" Wing Span

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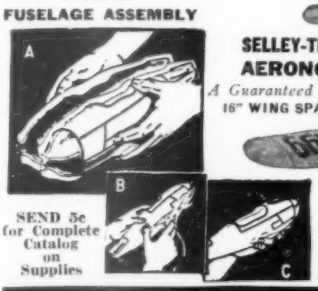

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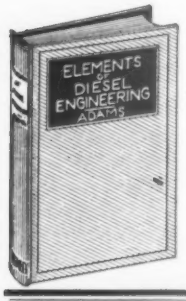

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Price $4.00

Popular Aviation
608 S. Dearborn St.
Chicago

China

(*Continued from page 38*)

Pflutsow took the papers, or what the papers were about, but he was to get away from the Japanese. He flew his Taube southwest along the coast of Shantung to Haichow, a small city near the coast in North Kiangsu.

The one hundred and twenty miles from Tsingtau to Haichow used so much of his fuel supply that he decided to land at that city and try to get fuel from the American missionaries there. He made a poor choice for his landing and came down in a field freshly plowed and made gummy by recent rains. He came in a little tail high and nosed over, completely wrecking his propeller.

When he found that there was no chance of getting a new propeller he decided to burn his ship and prevent the Japanese from getting it. My father, Dr. L. S. Morgan, and the other missionaries persuaded him to save the engine, wings, and landing gear for whatever use they might find for them. After the fuselage had been stripped of anything that had any possible use, he piled boxes around it and set them on fire, completely destroying his ship.

The pictures were made from negatives which have been stored since they were taken, and are therefore rather blurred. They show three views of the plane and one of the engine dismounted. Lt. Pflutsow is the man in the soft felt hat and European military clothes.

A few years ago Lt. Pflutsow published an autobiography in German. A short time after that he was killed in an airplane accident in South America.

This autobiography published by Lt. Pflutsow, formed part of a German library series, which proved very popular in German scientific circles after the war.

EDITOR'S NOTE: We thank our contributor and will endeavor to get further data.

END

Triangulation

(*Continued from page 48*)

flanges, and the number of joints and members greatly reduced, as sketches show in Sec. 13.

The triangulation of a glider (Sec. 14) and a float bottom (Sec. 15) is a simple matter. The fuselage design in Sec. 16 uses cross-wires for bracing that require turnbuckles, which could be eliminated by using crossed tubings; the tubes are welded to the frame, and one is always under tension.

Standard welded steel tube fuselage designs are shown in Sec. 20; triangulations of wing, I-strut, N-strut are shown in Secs. 17 and 18. The Howe and Warren type truss designs are used in laying out the welded steel spars shown in Sec. 19. These diagonal "web" members alternately take tension and compression stresses and they may be streamlined if so desired. The two kinds of trusses have their individual advantages for strength and economy.

Sec. 21 shows triangulation of a large metal rib, and Sec. 22 triangulation of a wooden rib with all loads carried by the lower chord. For comparison the same section shows the design for very light loading used by the Wright Brothers.

Loads should always be applied at the joint directly (or indirectly) as indicated in Sec. 23 and Sec. 24, except when an added load, usually a bending load, is considered when dimensioning the member.

Triangulations of tail surfaces and tail skid are shown in Secs. 25, 26, 27, and 28. Lately, however, the member close to the cloth covering is placed parallel with the line of airflow in order to reduce turbulencies.

Usually, in experimental planes, the engineer encounters the problem of removing a diagonal for access to the inside of the structure with no reduction of the strength of the design. These openings are doors, handholes, unbraced space for tanks and accessories.

Secs. 29, 30, 31, and 32 show solutions of the problem by carrying the load around corners within the frame or outside of it; or placing the triangulation into an adjacent panel. The years-ago popular "picture frame" (bent tubing) design should not be used (Sec. 31).

The airplane designer and the model engineer usually overtriangulate their first design, which is commendable, for it adds strength to the structure and therefore safety.

Nevertheless, each concentrated load should be at a joint braced three ways; these loads are carried by pulleys, bearings, walking-beams, seats, safety-belt connections, fittings connecting wings and landing-gear.

To aid the special conception of the structure a model may be built using ⅛ in. balsa sticks. The reduction of the general dimensions should be to a scale of one foot equals one inch. This model will not only help simplify the design, but also will aid speeding up manufacture of the plane or the mock-up in case one is wanted.

END

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11" BAMBOO
1/16x¼ 6 for 5c
Shredded 40. 5c
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ALUM. LEAF, 2 sheets for 1c
WIRE, 6 ft. 3c
Thinner Best
1 oz. 5c
Sheet Celluloid
2x6 .....2c
6x8 .....4c

12x16 .....15c
NOSE PLUGS, large ..10c doz. small ..5c doz.
Clear Dope
1 oz. 5c
½ pt. 25c
Miscellaneous Washers, ¼, ⅛ Doz. 1c
Sandpaper, pkg. 5c
Colored Dope
1 oz. 5c
½ pt. 30c
Clear Cement
1 oz. 5c
½ pt. 25c
1 pt. 45c
Wood Veneer
20x30" ..1 for 9c
2 for 17c
Reed
1/32, 1/16"
½" .....3 ft. 1c
½" .....3 for 2c
Wooden Wheels
½" .....pair 2c
¾" .....pair 3c
1" .....pair 4c

1⅛" .....pair 4c
1¾" .....pair 7c
Celluloid Wheels
¾" ....pair 5c
1" ....pair 7c
1⅜" ....pair 9c
1⅞" ....pair 15c
Balsa Balloon Wheels
½" ..1 pair 2c
¾" ..1 pair 3c
1" ..1 pair 4c
1¾" ..1 pair 5c
2" ..1 pair 8c
3" ..1 pair 14c
PROP. SHAFTS
2 for 1c
PAUL-O-WINA JAP PROPS
5" 10c
(Add 5c per inch for props up to 10".)
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Rubber Motors
1/16 sq. 20 ft. 5c
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Model Pins pkg. 5c
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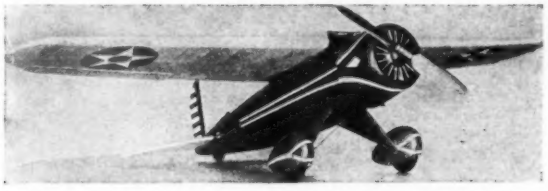
NEW CURTISS F11C4 NAVY PURSUIT

28" Span. Length 20½". Weight 4 oz. 1" Scale

THE MOST EXCLUSIVE AND FINEST EQUIPPED MODEL IN THE WORLD
A special De Luxe model, one of the most beautiful and finely detailed ever made, with its special exact scale 3⅜" celluloid. 1000 H.P. type, Wright Cyclone motor, having aluminum push rods, cylinder fins, etc., like real motor. Also in set are 4" aluminum cowl ring, 9" carved spruce semi-scale flying propeller, colored star and rudder insignia, 2" celluloid balloon wheels, silver dope, paint, black, red striping, Navy lettering, wire parts formed, axles, rubber motor, windshield, instrument board, flying wires, 4 aluminum step plates, aluminum wing walks, ready cut wheel pants, etc. All other parts printed on balsa. Detail scale drawing.
Construction Set complete, postpaid..... $4.50

41" LOCKHEED ARMY SPEED VEGA

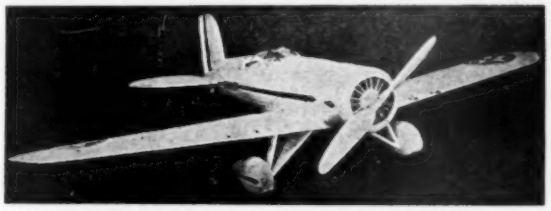


41" Span. Length 28". Weight 8 oz. 1" Scale

This new model, built very strong yet light in weight, is practically crashproof and will out-perform any large scale model built. Rises from ground in 10 feet and flies over 650 feet. Set contains all parts printed on balsa, ready cut pant cores, 4¼" turned motor front, 11" steel type carved paulownia wood propeller, 2½" balsa wheels, tail wheel, formed wire parts, 26' rubber, 3 oz. yellow dope, 2 oz. blue, ⅛ oz. black, 2 oz. glue, cement covering, full size scale drawing, and all parts.
Construction Set complete, postpaid..... $4.95

Note: In issuing money orders, use St. George, N. Y., postoffice

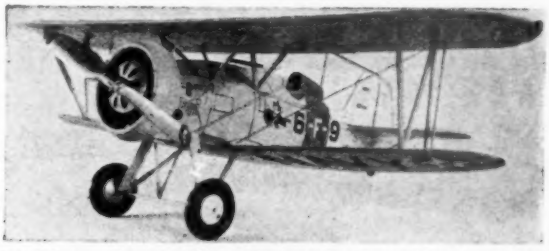
NEW LOCKHEED P23A NAVY FIGHTER



COMBINATION LAND AND SEA PLANE SET
32" Span. Length 20½". Weight 3½ oz. ¾" Scale

New 4-gun Navy fighter. Model will rise from land or water in few feet. Construction set contains fuselage and pontoon formers, wing ribs, tips, etc., printed on balsa, a 3⅜" turned cowl front, 2 instrument boards, colored insignia, lettering, windshields, 9" carved scale flying prop shown, 3 oz. silver paint, 1 oz. cement, ⅛ oz. black, 2 oz. glue, ready cut wheel pants, strong 2" aluminum wheels, 12 feet of rubber, and large 33"x44" drawing of land and sea plane. This is a sensational model and only one of its type in the world.
Construction Set in labeled gift box, postpaid..... $2.95

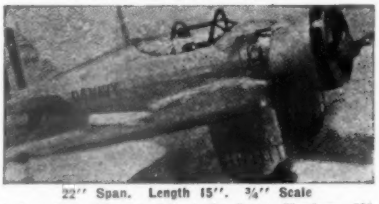
NEW BOEING F4B4 NAVY FIGHTER



22½" Span. Length 14½". Weight 2⅛ oz. Color, Grey, etc.

This is the finest equipped Boeing, F4B4 model in the world. New improved model exclusively equipped with new 3¼" special aluminum streamline tapered cowl ring, 9 cylinder celluloid motor with aluminum ventilator front, 8" carved varnished steel type propeller, printed out balsa wood parts, 2 oz. grey dope, ⅛ oz. yellow, ⅛ oz. red, paper cement, glue, formed wire parts, celluloid wheels, tail wheel, U. S. Navy lettering, colored insignia, and ¾" scale drawing.
Construction Set complete, postpaid..... $2.95

NORTHROP FT1 NAVY FIGHTER



22" Span. Length 15". ¾" Scale

A beautiful flying model of the latest Northrop 286 m.p.h. fighter. Set contains 3" turned motor front, 8" carved propeller, insignia, silver, black and clear dope, glue, all parts printed on balsa, full scale drawing, and all parts to build as shown.
Construction Set complete, postpaid..... $2.00

BOEING P26A ARMY PURSUIT

22" Span. Length 17½". ¾" Scale

150 of this fast pursuit plane are now in use in the U. S. Army. Construction set has 3" celluloid motor, 3½" tapered aluminum cowl, 8" steel type prop, set of colored paints, glue, etc., insignia, drawing, printed parts.
Construction Set complete, postpaid..... $2.75

LOCKHEED ELECTRA R-20-1

27½" Span. Length 17". ½" Scale

Set has all parts printed on balsa, turned motor fronts, carved steel type props, set of 3 colored paints, glue, etc., balsa wheels, concealed motor unit through fuselage. Scale drawing.
Construction Set complete, postpaid..... $2.95

NORTHROP A17 ARMY ATTACK

24" Span. Length 17". ½" Scale

Exact scale model of one of the 125 new attack Northrops just ordered by the U. S. Army. Set has 2½" turned motor front, 7" steel type prop, insignias, set of colored liquids, glue, etc., all parts printed on balsa, full size scale drawing, and all parts.
Construction Set complete, postpaid..... $2.50

LUSCOMBE PHANTOM SPORTPLANE

31" Span. Length 18". 1" Scale

Construction set contains all parts printed on balsa, 8" steel type carved prop, complete set of colored dopes, glue, etc., detail drawing, and all parts.
Construction Set complete, postpaid..... $2.95

LOCKHEED ARMY VEGA—GAS MODEL

82" Span. Length 54". Weight 5 lbs. 2" Scale

Special de luxe set. All parts ready cut out, ribs, formers, wheel pants, etc. Silk covering, set of colored paints, glue, etc., turned motor front, 4½" rubber M & M Air Wheels, full sized detail drawing.
Construction set without motor, postpaid..... $25.00

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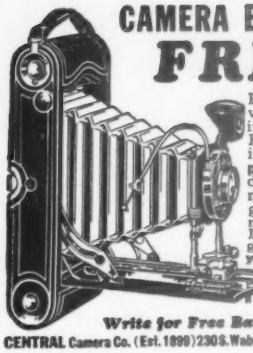

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RAS

Air Board

(*Continued from page* 40)

thought on the whole to be fair and unbiased. These questions and a detailed analysis of the final report will be dealt with at a later meeting. We can however set down the high spots of an informal talk which Colonel Harold E. Hartney delivered and which was welcomed all the more because the Board was listening to one of the real authors of the safety report.

Here was a good point: Russia spends $85,000,000 on meteorology per annum. The U.S.A. only $3,000,000. Since meteorology is so vital a part of aviation, certainly there is something here that should be rectified.

Another good point: The Federal Communications Commission rules over frequencies allotted for various purposes. A good many frequencies are tied up that might well be released to aviation radio transmission, as certain frequencies are less erratic than others. Could not the Federal Communications Commission revise its restrictions and give aviation a helping hand?

Our system of Government imperfect as it is has functioned and under it there has been a wonderful development of American industry, not forgetting its latest development—flying. Colonel Hartney's view was that there was nothing radically wrong with the present governmental set-up relating to aviation, but agencies should not be allowed to take up unrightful functions. Control and regulation should be in one branch; experimental development in another; quasi-judicial duty should rest with such a body as the I.C.C. Limited to their proper spheres, free from political influences and jealousies, there is no reason why present agencies should not continue to help American aviation in the best possible manner.

Colonel Hartney made a strong plea for the appointment of an Assistant Secretary for Aeronautics in the Department of Air Commerce (just as the Air Board had recently recommended in a letter to the President). He recalled that while the Commerce Act of 1926 had followed on the splendid work of the Morrow Bill, it definitely called for an Assistant Secretary of Aeronautics in the Commerce Department.

An executive order dated June, 1933, caused this office to remain unoccupied. True the same has been done in the Army and Navy. But the Navy Board has taken on many flying officers and there are eight Air Corps officers on the general staff, who have a strong voice in guiding Army aviation.

Various reactions as to the effect of the Board's recommendation to the present were expressed by those present, and with particular reference to the letters received from the readers of POPULAR AVIATION, in which magazine, the recommendations first appeared.

The replies were so varied in content that the matter of further discussion reserved for some time in the future at which the letters could be read and discussed in their entirety.

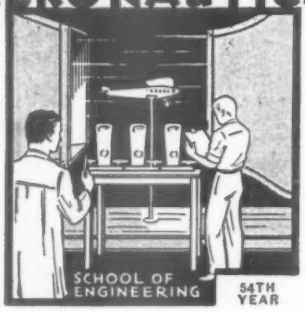
Colonel Hartney pointed out that while William P. MacCracken, Jr., was Assistant Secretary of Commerce, the Air Commerce Bureau had functioned splendidly. He contrasted this with the bickering and wholly subordinate position occupied by the Director since the Assistant Secretaryship for Aeronautics in the Department of Commerce has been discontinued.

The distinguished visitor looked at matters from a slighted different viewpoint, but certainly strengthened the Board's conviction that they had acted wisely in their recommendations to the President.

END

AERONAUTICAL ENGINEERING

DEGREE IN 2 YEARS



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One finished flywheel mounted on motor with every finished motor.

$12.50 Postpaid

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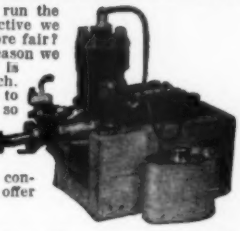
We give you 10 days' time to inspect all parts and actually run the motor. If at the end of that period you find any part defective we shall be glad to replace it free of charge. Can anything be more fair? Never before was such an open offer ever made. Here is the reason we are able to offer this unusual guarantee. The G.H.Q. motor is the result of years of exhaustive, scientific, aerodynamic research. Every motor is given a gruelling test and run before shipped to you. We have spared no expense in modern factory production so that we may be certain of one thing—that each motor is uniform in every respect. Our tremendous output (thousands of motors have already been bought) together with the fact that we are one of the largest concerns of its kind in the model airplane field, is your assurance that each G.H.Q. motor conforms to its high standard of performance. That is why we are able to offer this broad unconditional guarantee.



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It is the modern miniature motor designed exactly as present day real motors that has broken records for amazing performance. And look at the reason! In many cases we could have saved considerable money using inferior parts. Examine each part closely. Look at the life-time high-speed bronze connecting rod—and the crank shaft 5/16" thick as compared to other motors selling at twice the price having a thickness of only 3/16". Then, too, G.H.Q. has one of the largest crank-shafts of any motor—as well as the fool-proof long life timer.

THE PRICE IS SO LOW—WE CAN'T SELL TO DEALERS

The G.H.Q. Motor is priced especially low so that you may deal direct with our factory. Even though dealers have asked to handle this product, we have not been able to give them a special dealer's price. This famous motor, complete, entirely assembled on stand, tested and run before shipment, performance guaranteed. No oil, gas or batteries included. Postpaid for only $12.50. Free—one finished fly-wheel mounted on motor with every finished motor..... **$12.50**

STANDARD WARRANTY

"We warrant each new G.H.Q. gasoline engine manufactured by us, to be free from defects in material and workmanship under normal use and service, our obligation under this warranty being limited to making good at our factory, any part or parts thereof, which shall, within ten (10) days after delivery of such motor to the original purchaser, be returned to us with transportation charges prepaid, and which our examination shall disclose to our satisfaction, to have been thus defective; this warranty being expressly in lieu of all other warranties expressed or implied and of all other obligations or liabilities on our part, and we neither assume nor authorize any other person to assume for us any other liability in connection with the sale of our G.H.Q. gasoline engine."

G. H. Q. GAS KITS

Here is your opportunity to obtain a kit of this famous motor. Assemble it easily yourself and save money. Everything is in the kit including plug, coil, condenser, tank, ignition wire, cylinder, piston, connecting rod, timer, crank-shaft, all screws, nuts, bolts, etc. No oil, gas, batteries, or propeller included. Postpaid for only..... **$8.50**

G.H.Q. SCORES AGAIN!

With this reprint of an editorial from April issue of Modern Mechanix

Gasoline powered airplane models are finding great favor with aviation fans and a $3 prize was awarded to Francis Kosanda, of Hopkins, Minn., for his interesting letter:

Francis Kosanda, of Hopkins, Minn., holds gasoline powered model he and Robert Apgar constructed. On its initial flight, the 9-foot model flew out of sight but was recovered again.

Hopkins, Minn.

Dear Editor:

Enclosed is a photo of a gas powered model airplane built by Robert Apgar, of Minneapolis, and myself. It is of original design and powered with a G.H.Q. motor.

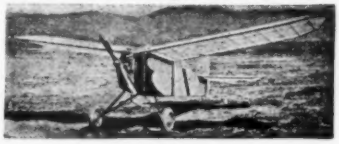
The model weighs five and one-half pounds, has a wing span of nine feet, and an aspect ratio of 8-1. On a test flight the model went out of sight after ten minutes, but was later recovered from a tree overhanging the Mississippi River.

Your articles on gas engines, gas models, and model airplanes are excellent.

Francis Kosanda.

Judging from the report, the gas model must be an excellent cloud chaser and we are glad it was recovered without serious damage.

G. H. Q. SPORTSTER KIT



The G.H.Q. Sportster kit especially designed for G.H.Q. Gasoline Motor but may be used for any other motor of like weight and power. Built according to scientific aero-dynamic principles—Has made hundreds of successful flights without crackup—Marvelous glider . . . And what a climber!

A complete kit of all parts including plan, all wood, wire, wheels, metal and all other parts. Postpaid for only **$5.00**

5 ft. Flying Scale Models 1/3 size of real planes!

$1 EACH
PLUS 35c for PACKING, POSTAGE & INSURANCE
IF EXPRESS COLLECT SEND ONLY $1.00

These are the giant models that have amazed the model builders of America. Imagine strong outdoor flyers that are actually one-third the size of passenger carrying planes—a $10 value for only $1.00. Everything is in the kit including all liquids—nothing else to buy!

CONTENTS: Each of these new G.H.Q. Giant 5 ft. Model Planes contains full-size Plans, all ribs, formers and curved parts clearly printed on best grade Balsa. Large bottles Cement and Dope, different colors Japanese Tissue, Special Endurance Rubber, finished Ready-Cut 3" Wheels, Wire, Balsa strips cut to size. Washers, and . . . Movable Controls, shock-proof Landing Gear, Scale Details, Lettering, Numbering and Insignias, Flight Log, etc.

5 ft. Monocoupe, also 5 ft. Heath Parasol and 5 ft. Stinson Reliant.

FLASH! If you are interested in special contest and speed work, write us (enclose 3c postage) for folder giving details on "souping" up and lightening your G.H.Q. engine.

Send 10c for illustrated catalog of gasoline motors, gasoline planes, gasoline accessories and parts. We have a complete line of kits from.. 10c to $1.00

G. H. Q. MODEL AIRPLANE CO.

854-P East 149th Street
NEW YORK, N. Y.

XUM

Colonel Blotz

(*Continued from page 20*)

ingly follows Pan American Airways' trans-Pacific system to Honolulu, Midway, Wake, Guam, Manila and Hongkong. Then he "braves" his way down the China coast to where he picks up Imperial Airways' route.

Then he takes his choice of either the Imperial route or that of K.L.M., the Dutch line, or of Air France. Whatever line he chooses he then follows across Siam, into India, up through Persia, along the Mediterranean into Europe and to either London or Paris. From there it's a matter of 3,300 miles across the Atlantic and he's home—unless you insist that he follow an American airline across the United States to make it legal.

Yes, that's a long flight Colonel Blotz has made. There has been plenty of rough country below him. He has spanned the world's largest oceans. He has done all that, but how? As the kind of a man the captain of a small ship is? Oh, no. Everyone has overlooked one thing: the airplane and its equipment.

What would the daringly brave Colonel have done had not a corps of the best engine builders in the country collaborated to give him the best, most reliable engines their years of skill could turn out?

What would the Colonel have done had not the airplane manufacturer built him an airplane that could withstand any weather or stresses that flight would require?

Suppose that airplane hadn't been capable of carrying 1,150 gallons of precious gasoline?

Suppose unknown and unheard of radio engineers had not sweated night after night over that airplane's radio compass and radio transmitters and receivers?

Suppose technicians hadn't done a good job in installing the plane's gyro (automatic) pilot? Suppose the instrument men had left out or damaged the artificial horizon, the very vital directional gyro, the altimeter or even the fuel gauges?

Now a picture slightly different from that painted by newspapers and press agents—and Colonel Blotz—begins to take form. The Colonel may have been a red hot pilot out over the ocean but if the grease-covered engine men hadn't been the experts they are, well, it's happened before. And the Colonel said very little about tuning in his radio compass on Pan American's radio stations along the Pacific route, setting his gyro pilot and ambling back into the cabin to munch a sandwich.

Even if the de-icer men had slipped somewhere, all the Colonel's "daring and experience" wouldn't have kept him out of the ocean.

Yes, it was a long, monotonous flight. Broken only when crowds greeted this daring man at cities around the globe. But if it ever had come to the point where the Colonel's flight demanded some real knowledge of aviation, he would have set his ship down in a hurry and called loudly for help. Then some more engine or instrument men would hurry to the scene, repair the damage and disappear again into oblivion . . .

Only very few "great flights" really can be called great. The majority, like this imaginary junket of Colonel Blotz, usually are just the well-publicized efforts of airmen—or airwomen—who are no more capable than this country's 16,000 other licensed pilots. But when they do get credit, that credit generally goes to anyone but those who really deserve it.

Next time you read of some aviator who supposedly knocks the world dead with a ballyhoo adventure, well, just stop and think for a few minutes.

No one gives credit to the engine or gasoline, the two units that are actually concerned in the success of the flight and to which all other units are accessories.

END

WOULD YOU LIKE TO WIN $10 CASH AND $10 WORTH OF KITS OR SUPPLIES FREE

All you have to do is find the greatest number of words in the letters IMPERIAL MODEL.
Number the words from 1 up. Put each on a separate line. Do not use names or proper nouns.
Send in your entry with an order for $1 or more, not later than July 31, 1937. The decision of the judges will be final. In case of tie, duplicate prizes will be awarded.
The winner gets $10 cash and $10 worth of any kits or supplies in the Imperial line, or, if desired, a BROWN JR. GAS MOTOR.
Whether you win the Grand Prize or not, your entry entitles you to free membership in the Imperial Club, with free Club Pin—together with our regular Free offer. THE SIMPLEST CONTEST YOU EVER ENTERED!
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With all orders for $1.00 or over of supplies only—your choice of one (only) of these FREE OFFERS. Order at least $1.00 of supplies only to get free offer.

FREE
1. Large bottle clear cement and 100 1/16x1/16x18 balsa.
2. 50 ft. 1/8 flat rubber.
3. 3 sheets silver tissue.
4. 1 skein 1/8 flat rubber. Add 20c packing charge for offer No. 4.

Free postage on all orders in U.S. for 75c or over. Under 75c, add 10c. West of Miss., add 10c extra. Canada, U. S. possessions, and foreign, over $1.00, add 15%. Foreign, under $1.00 add 15c. No C.O.D. No stamps.

18" BALSA
1/16x1/16 100. 5c
1/16x1/8 35 for 5c
1/16x3/16 18. 5c
1/16x1/4 15 for 5c
1/16x1/2 5 for 5c
3/32x3/32 30. 5c
1/8x1/8 30 for 5c
1/8x3/16 12 for 5c
1/8x1/4 10 for 5c
3/16x3/16 8. 5c
1/4x1/4 6 for 5c
1/4x1/2 3 for 5c
1/2x1/2 2 for 5c
1/64x2 6 for 10c
1/32x2 8 for 10c
1/16x2 8 for 10c
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1/8x2 6 for 10c
3/16x2 3 for 9c
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3" sheets or 36" lengths, double above prices; add 10c packing charge for 36" lengths.
12" Sheets
1/16x2 12 for 10c
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24" Sheets
double above prices
18" PLANKS
1x1 5c; 1/2x2 6c
1x1 1/2 9c; 1x2 10c
1x3 15c; 2x2 18c
2x3 23c; 2x6 39c
3x3 40c; 3x6 75c

TISSUE, AA
All col.. doz. 10c
Silver.....ea., 5c
Superfine, wt. 5c
WHEELS, per pr.

Birch	Bass	Celu
1/2	.01	.03
3/4	.02	.04
1	.03	.05
1 3/4	.04	.08
1 7/8	.07	.10
3		.15

PINE WHLS., pr.
Both sides alike.
3/4" 4c; 1" 6c
1 3/8" 8c; 1 7/8" 12c
NOSE BLOCKS
1x2x1 .....1c
2x2x1 .....2c
2x2 1/2x1 .....3c
3x3x1 .....5c
3x3x2 .....8c
3x3x3 .....10c
INSIGNIA
24 and stripes 5c
WASHERS
1 doz. 1/8 or 1/4 1c
THRUST BEARINGS
Small...doz. 10c
Large...doz. 15c
RUBBER
.045 ....25 ft. 5c
1/16 sq.. 20 ft. 5c
1/8 flat..15 ft. 5c
3/16 flat 12 ft. 5c
Skein 50c

RUBBER LUBRICANT
Large bottle 10c
PROPELLER BLOCKS

1/2x	3/4x	5	8—5c
1/2x	3/4x	6	6—5c
5/8x1		x 7	4—5c
5/8x1		x 8	3—5c
3/4x1 1/4x10			2—5c
3/4x1 1/4x12			3c ea.
1	x1 1/2x12		4c ea.
1	x1 1/2x15		6c ea.

SHEET ALUM.
.0003x3 1/2...ft. 1c
.005 in. 6x1/2 5c
.010 in. 6x6 6c
CLEAR DOPE
5c per oz.; Large bottle, 8c; 1/2 pt. 30c; 1 pt. 45c
THINNER
Same as clear dope
COLORED DOPE
6c per oz.; Large bottle, 10c; 1/2 pt. 35c; pt. 60c
CLEAR CEMENT
5c per oz.; Large bottle, 8c; 1/2 pt. 35c; 1 pt. 55c
MACHINE-CUT BALSA PROPS
5" 4c; 6" 5c
7" 6c; 8" 7c
10" 8c; 12" 10c
15"...15c

CAMEL'S HAIR BRUSHES
Small 3c; Lge. 5c
Extra large... 8c
NOSE PLUGS
1/2" ....12 for 5c
DUMMY RAD. ENGINE (Celu.)
1 1/2" d. 15c; 2" d. 20c; 3" d. 25c.
ENGINE AND COWL (Celu.)
1 1/2" dia. 15c
2" dia. 20c
3" dia. 25c
CELLULOID PANTS, per pair
1/2" to 1" 18c
1 3/8" to 1 7/8" 33c
METAL PROPELLERS
2 blades 3 blades
1 1/2"..5c.... .08
2 1/2"..10c.... .10
3 1/2"..15c.... .20
4 1/2"..20c.... .25
ALUM. TUBING
1/16, 3/32, 1/8 ft. 7c
3/16 or 1/4 ft. 10c
ALUM. COWLINGS
1 1/2" 15c 2" 18c
3" 25c
Specify whether anti-drag or closed

BOMBS
3/4"..4c 1 1/4"..7c
3"..12c
GUNS WITH RING MOUNT
1 1/4" 10c 1 3/8" 15c
PURSUIT MACH. GUNS
3/4", 1 1/4" or 1 1/2", each 5c
BUSHINGS
1/16.....4 for 1c
WOND. WATER SPRAYER 15c
MODEL PINS
1/2" or 1" pkg. 5c
SANDPAPER
Doz. sheets....5c
PROP. SHAFTS, REAR HOOKS
Doz. 8c
MODEL STANDS
Sm. 15c; lg. 25c

BAMBOO
1/16 sq. x 12, 36, 5c
1/16 x 1/4 x 15, dz. 10c
DOWELS
1/16x6 ...doz. 5c
1/4x18 ...2 for 3c
3/16x1/4 ..2 for 5c
WIRE
6-8-10-12-14 .....2 ft. 1c
WOOD VENEER PAPER
20x30..1 for 10c
BAMBOO PAPER
2 for 15c
CELLULOID
6x8 .....5c
12 1/2x16 .....18c
WING AND TAIL LIGHTS
12" 10c; 15" 15c; 24" 20c.
REED
1/32-1/16, 2 for 1c
3/32-1/8, 1 ft. 1c

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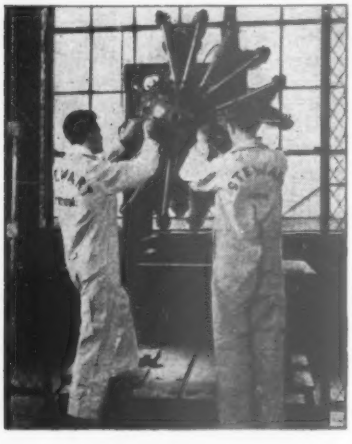

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Approved by Bureau of Air Commerce as an
AIRPLANE AND ENGINE MECHANICS' SCHOOL

Engines

(*Continued from page* 18)

at cruising speed the motor only uses one and a half gallons of fuel.

These motors are fitted with Zenith type carbureters, and the dry-weight of the Mark I Sprite is 77.5 pounds, while the Mark II has a dry weight of 86.0 pounds. The dimensions of the Mark I are as follows: overall length 19.75 inches, overall height 11.75 inches, and the overall width 25.75 inches. The Mark II Sprite carries these same measurements except for its height which is 12.75 inches.

Carden Aero Engines Ltd. has developed a different type of motor from that of Aero Engines Ltd. in that they have taken a four cylinder automobile motor, cooled by water, which develops approximately 33.0 horsepower. The rated power of the Carden is 30.0 horsepower at 3,300 revolutions per minute.

The cylinders are of an "L" type head, and having a bore of 2.5 inches with a stroke of 3.64 inches.

The displacement of the Carden motor is 71.5 cubic inches, while the compression ration is 6:1. This motor as the "Sprite," is also among those by the British private pilot for its economical operation cost. At cruising throttle the ship only consumes two gallons of fuel per hour and one-half gallon of oil in the same period of time.

The Carden motor, fitted and ready to turn over, has a total weight of 350 pounds, and has an overall length of 21.86 inches with an overall height of 18.0 inches and a breadth of a little less than 18.0 inches.

These two types of aircraft motors have lent themselves to a variety of planes. The Carden has been tried in the Tipsy, designed by Mr. E. O. Tips of Avions Tipsy, Aerodrome, Gosselies, Belgium, with success permitting the plane a speed of ninety miles per hour on about twenty-five horsepower.

END

BIG MONEY Assembling NEW Portable OUTBOARD BOAT

TAKES ANY OUTBOARD 4 H. P. or less

Assemble your OK-2 in 2 days at home! Thousands asked for a light, tough, durable seaworthy, portable, Outboard Boat—and here it is—weight only 50 lbs.! Safe, leak-proof, trouble-free, ideal for touring, hunting, fishing, camping! More speed per H.P., more miles per gallon. Our perfected aluminum-ribbed cut-to-fit construction Kit GUARANTEEs successful assembly, quickly, easily, economically. Low Introductory Prices.

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Two Winning Gas Models

★ Here are two swell gas models—with all of the latest improvements that make each a winner in its price class. The wings shear off to prevent damage to model in case of bad landings, shock absorbing landing gears, adjustable tail surfaces, ***new type*** motor mount, model balanced by means of adjustable battery rack. Each kit complete with all necessary parts to build models as shown. These models knock down to a very compact size to allow carrying anywhere—on street car, bus or automobile. Any small gas motor will make them champions! ★

PICK YOUR WINNER !

The SILVER FLYER

Span 6 ft. Length 3' 6"
Chord of wing 10"

Our NEW trim single seater pursuit that will give you many enjoyable hours—enjoy building it—enjoy flying it. Complete kit with full size plan, balsa air wheels, sheet aluminum, printed out balsa parts, screws, bolts, etc.

Price of kit only ..... $ 5.00
Complete kit with Baby Cyclone Motor 22.25
Add 35c to cover cost of packing and mailing.

The REARWIN Speedster

Span over 6 ft. Length 3' 6"
Chord of wing 10"

This contest winner is a favorite all over the country. Hundreds have built, flown, and are still enjoying it. Complete kit with balsa air wheels, colored dopes, full size plan, screws, bolts, sheet aluminum, and many parts too numerous to mention.

Price for this super kit only ..... $ 6.50
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